

Group: Ivan Matoshchuk, David Neufeld

Assignment 1

Hello dear students. You have successfully cloned the repo, great.

- Exercise 0: Warm up tasks.
- Exercise 1: Color spaces and morphological operators (Lecture 1)
- Exercise 2: Convolution and Canny Edge detection (Lecture 2)

Exercise 0 - Image-I/O

There are several python libraries for reading and displaying images. I recommend scikit-image. Execute the next cell and install missing libraries like scikit-image.

```
# imports
%matplotlib inline
from skimage import io, data, color
import matplotlib.pyplot as plt
import matplotlib.image as mpimg
import numpy as np

image = io.imread('images/dog.jpg')
io.imshow(image)

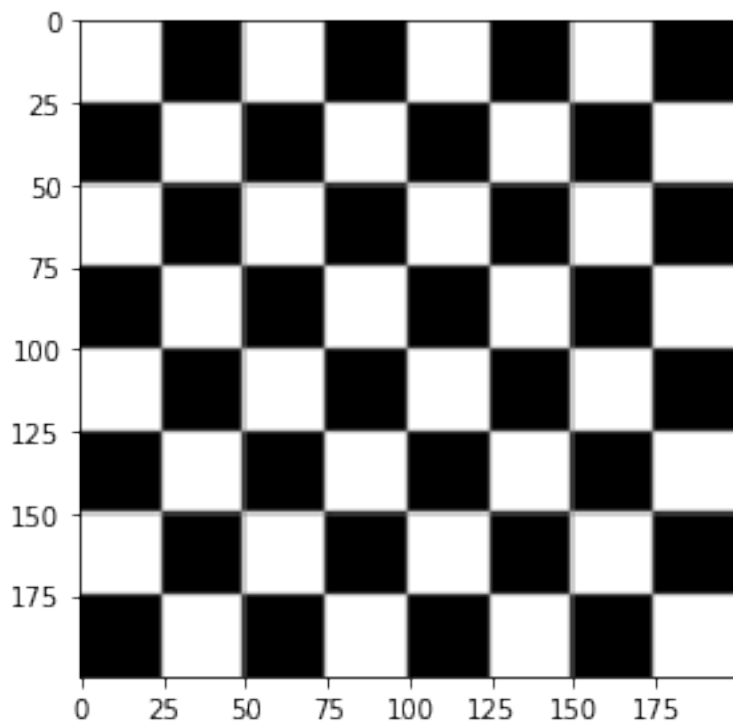
<matplotlib.image.AxesImage at 0x7fe0d26489a0>
```



By the way, there are many test images in `skimage.data` that you can use for your tasks. Execute the next two cells.

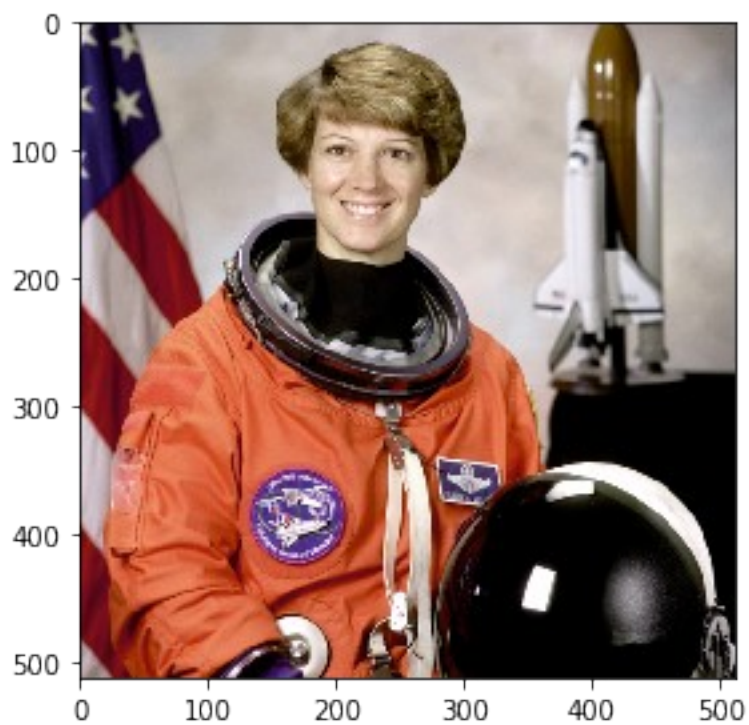
```
io.imshow(data.checkerboard())
```

```
<matplotlib.image.AxesImage at 0x7fe0e81d0d90>
```



```
io.imshow(data.astronaut())
```

```
<matplotlib.image.AxesImage at 0x7fe0e81563d0>
```



Add a line of code to the next cell to display $440 \leq x \leq 540$ and $250 \leq y \leq 390$ for the dog image!

```
image.shape
```

```
(506, 760, 3)
```

```
io.imshow(image[250:390,440:540,:])
```

```
<matplotlib.image.AxesImage at 0x7fe0e812d9a0>
```



Now convert the color image to a grayscale image and display it!

```
io.imshow(color.rgb2gray(image))
```

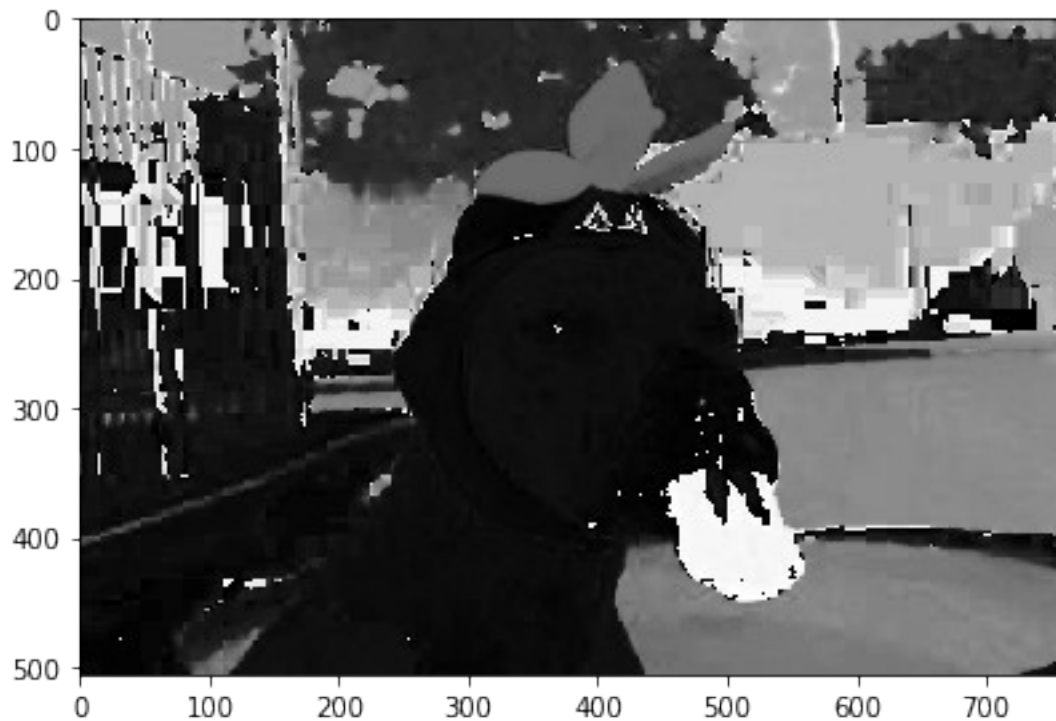
```
<matplotlib.image.AxesImage at 0x7fe0e8093ee0>
```



There are other color spaces. For example, HSV will be used in the lecture. Convert your image to HSV and display the H-channel.

```
io.imshow(color.rgb2hsv(image)[...,0])
```

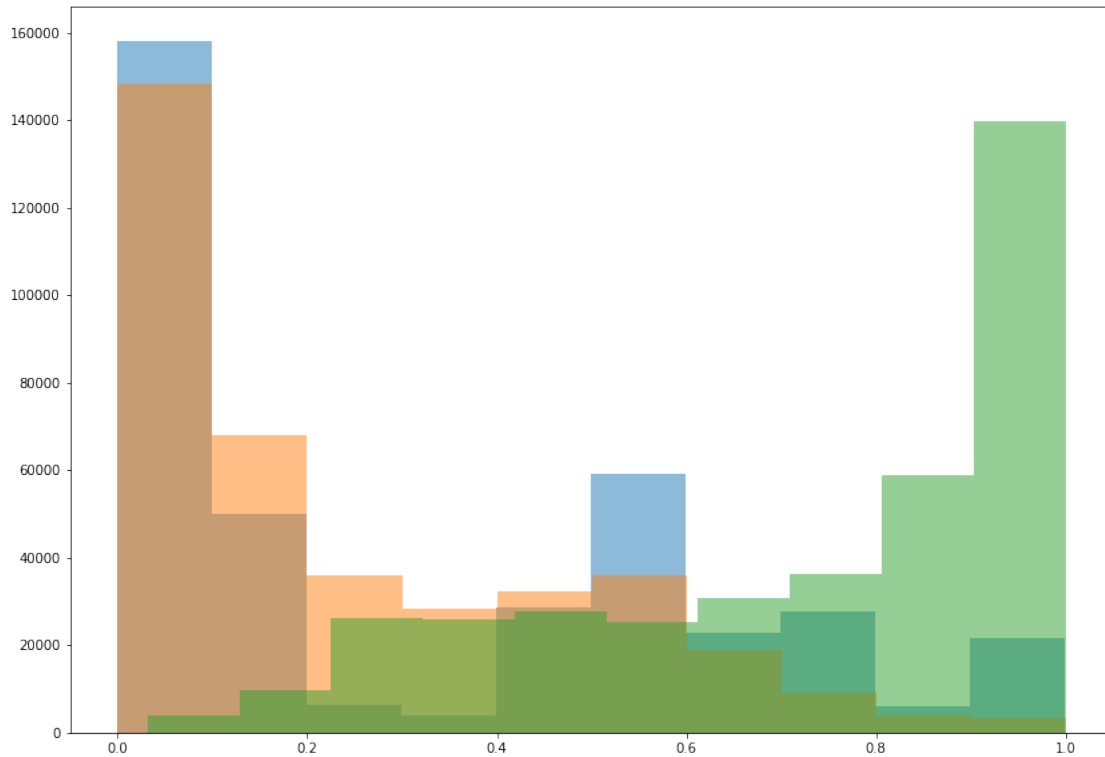
```
<matplotlib.image.AxesImage at 0x7fe0e37cc1c0>
```



Did you know that HSV now allows creating robust (i.e. lighting independent) color histograms? Create one with Matplotlib!

```
plt.figure(figsize = (14,10))
plt.hist(color.rgb2hsv(image)[...,0].flatten(), alpha= 0.5, label =
"Hue")
plt.hist(color.rgb2hsv(image)[...,1].flatten(), alpha= 0.5, label =
"Saturation")
plt.hist(color.rgb2hsv(image)[...,2].flatten(), alpha= 0.5, label =
"Value")

plt.legend
plt.show()
```



Exercise 1 - Color Spaces, Morphological Operators

Exercise 1.1

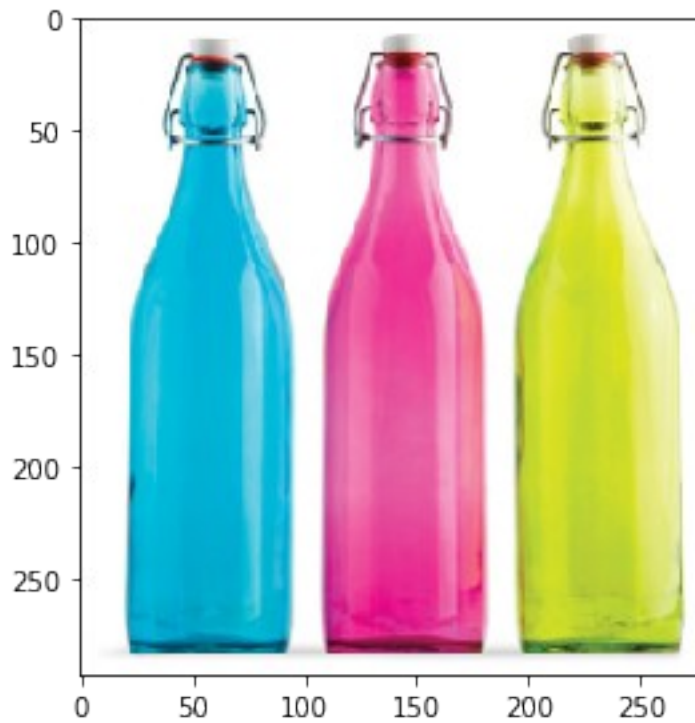
For an image of your choice, implement the simple binarization method as shown in the lecture. We've put some example images in /images and provided you with one in the next cell.

Rough sketch:

1. define the „positive“ subspace P in the RGB cube
2. iterate over all pixels in I and check if in P or $\sim P$
3. write result to new image
4. play around with size and shape of P and display binary image (**RESULT**)

```
image = io.imread('images/bottles.png')
io.imshow(image)
```

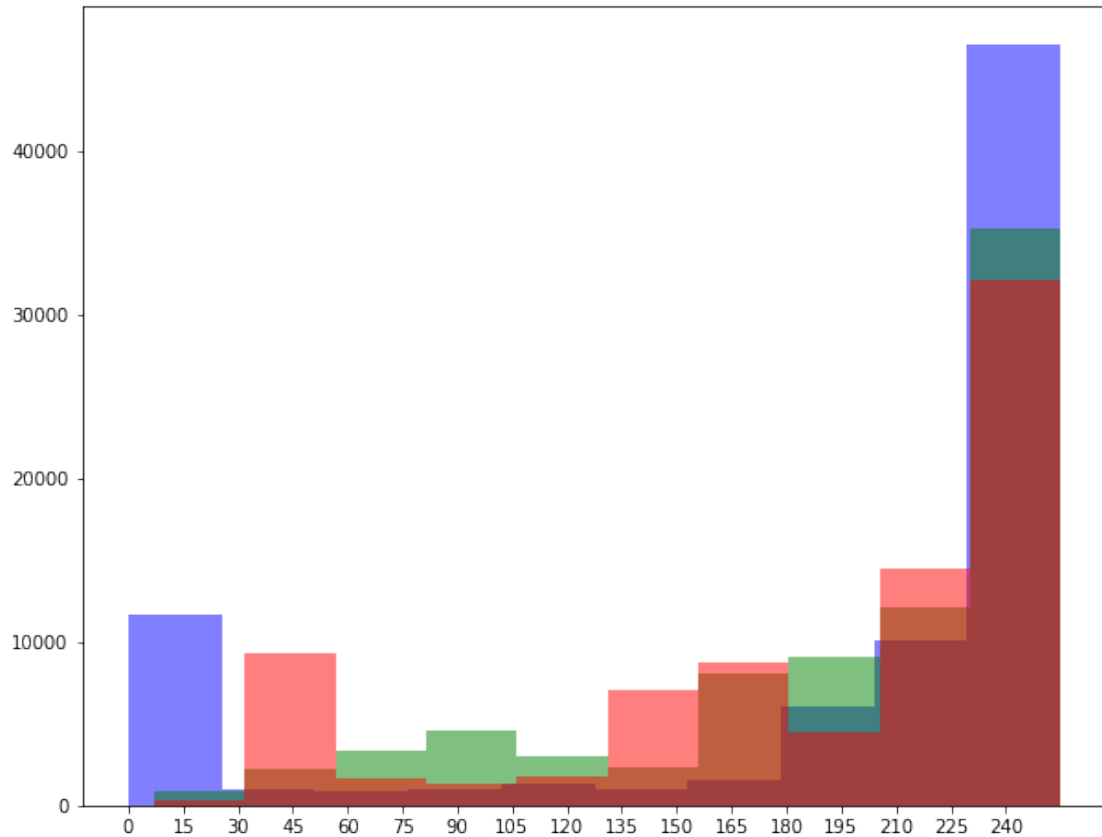
```
<matplotlib.image.AxesImage at 0x7f7767869a90>
```



```
# plot color distribution
plt.figure(figsize = (10,8))
colors = ["b","g","r"]

for idx,i in enumerate(colors):
    plt.hist(image[...,idx].flatten(), color = i, alpha = 0.5)
    plt.xticks(range(0,255,15))

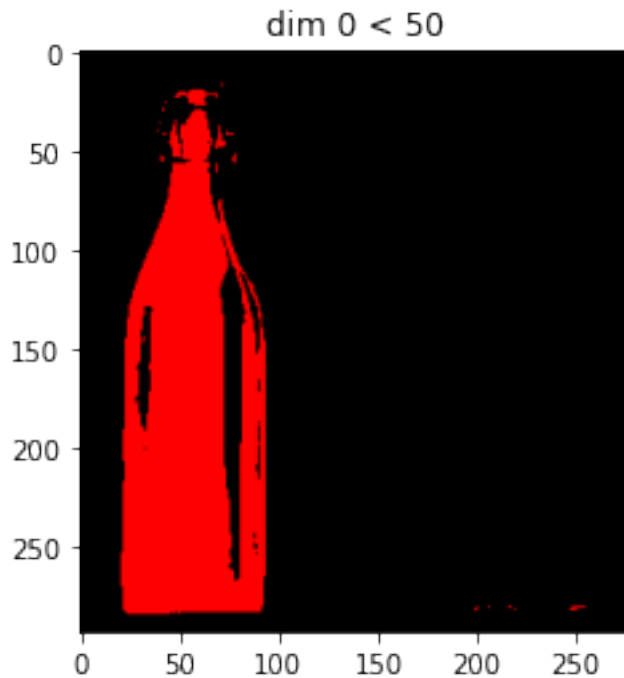
plt.show()
```

```
def binarization(image: np.ndarray, mask : tuple, used_dim: int,
description : str, plot : bool = True) -> np.ndarray:
    binarized_array = np.zeros_like(image)
    if used_dim == -1:
        binarized_array[mask[0], mask[1],:] = 255
    else:
        binarized_array[mask[0], mask[1],used_dim] = 255

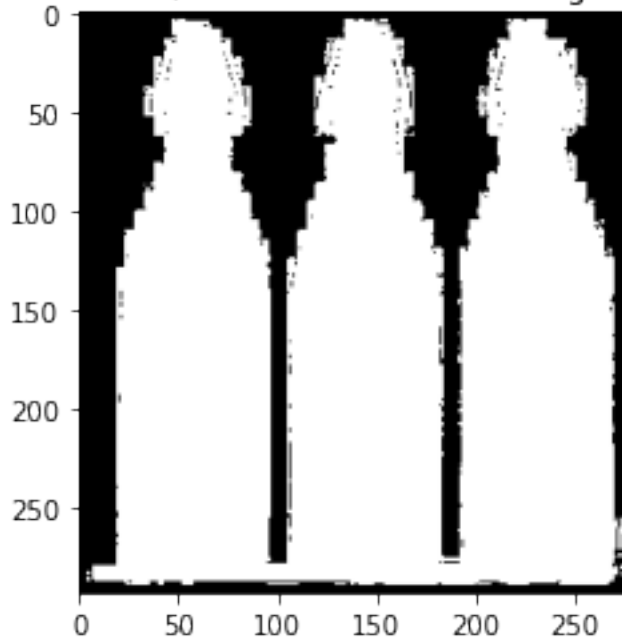
    if plot:
        plt.imshow(binarized_array)
        plt.title(description)
    return binarized_array

mask = np.where(image[...,0] < 50)
binarized_array = binarization(image, mask, used_dim = 0, description
= "dim 0 < 50")
```

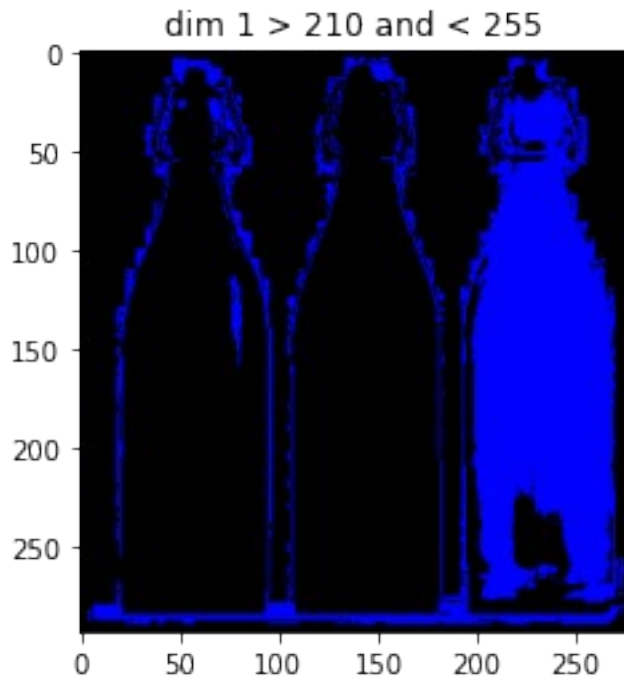


```
# all three bottles
mask = np.where((image < 255))
binarized_array = binarization(image, mask, used_dim = -1, description
= "all dims < 255 (255 is the value of background color)")
```

all dims < 255 (255 is the value of background color)



```
mask = np.where((image[...,1] > 210) & (image[...,1] < 255))
binarized_array = binarization(image, mask, used_dim = 2, description
= "dim 1 > 210 and < 255")
```



BGR ?

Bottle in the center

plot color distribution of the center of the image (pink bottle)

```
plt.figure(figsize = (10,8))
```

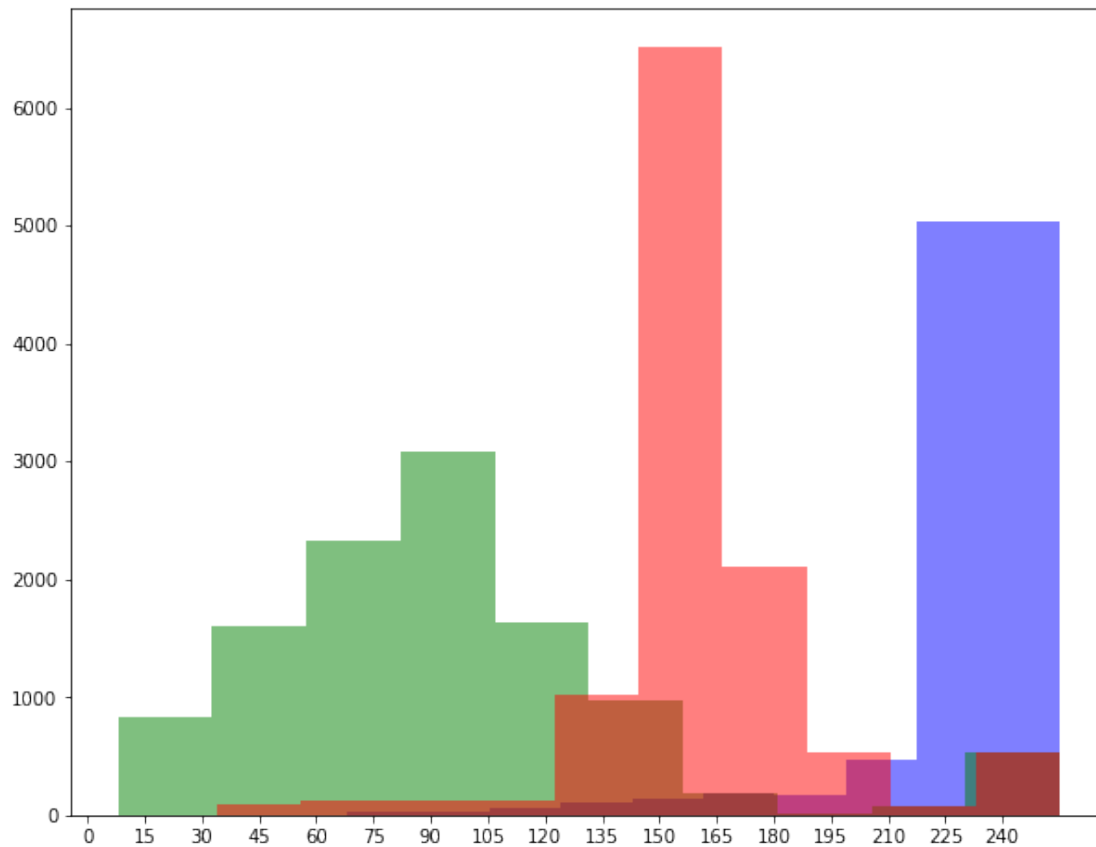
```
colors = ["b","g","r"]
```

```
for idx,i in enumerate(colors):
```

```
    plt.hist(image[120:,110:175,:][...,idx].flatten(), color = i,  
alpha = 0.5)
```

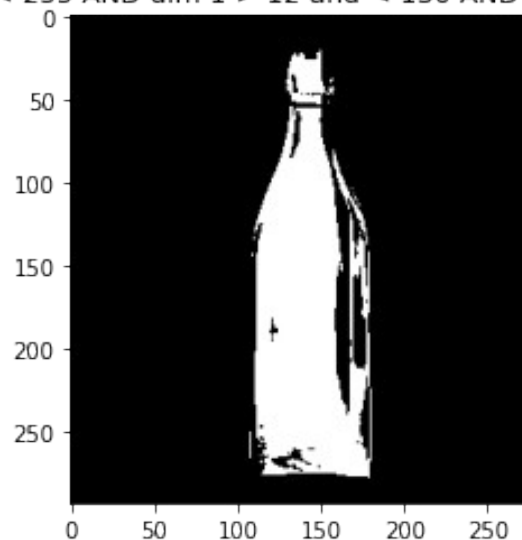
```
    plt.xticks(range(0,255,15))
```

```
plt.show()
```



```
mask = np.where(((image[...,0] > 210) & (image[...,0] < 255)) &
((image[...,1] > 12) & (image[...,1] < 130)) & ((image[...,2] >
135)&(image[...,2] < 210)))
binarized_array = binarization(image, mask, used_dim = -1, description
= "dim 0 > 210 and < 255 AND dim 1 > 12 and < 130 AND dim 2 > 135 and
< 210")
```

dim 0 > 210 and < 255 AND dim 1 > 12 and < 130 AND dim 2 > 135 and < 210



Exercise 1.2

- starting from the binary color detection image
- erase noise with an erosion operation
- dilate once to get original size of object
- find connected components with the two-pass algorithm
- extract bounding box on the fly
- draw bounding box on original image (**RESULT**)

Test on array from lecture

```
input_array = np.array([[0,0,0,0,0],[0,1,1,0,0], [1,1,1,0,0],  
[0,1,0,0,0], [0,0,0,0,0]])  
print(input_array)
```

```
[[0 0 0 0 0]  
 [0 1 1 0 0]  
 [1 1 1 0 0]  
 [0 1 0 0 0]  
 [0 0 0 0 0]]
```

```
kernel = np.array([[0,1,0],[1,1,1],[0,1,0]])  
print(kernel)
```

```
[[0 1 0]  
 [1 1 1]  
 [0 1 0]]
```

```
from tqdm.notebook import tqdm
```

```
def set_steps(input_array_side_size: int, kernel_side_size: int) ->  
int:
```

```
    if (input_array_side_size - kernel_side_size) % 2 != 0:  
        return input_array_side_size - kernel_side_size  
    else:  
        return input_array_side_size - kernel_side_size + 1
```

```
def apply_morphological_operators(input_array: np.ndarray, kernel:  
np.ndarray, pixel_value: int = 255, method: str = "dilate") ->  
np.ndarray:
```

```
    kernel_size = kernel.shape[0]
```

```
    output_array = np.copy(input_array)
```

```
    if input_array.shape[0] % 2 != 0:  
        print("padded input array")  
        input_array = np.pad(input_array,1)
```

```
    steps_height = set_steps(input_array.shape[0], kernel.shape[0])  
    steps_width = set_steps(input_array.shape[1], kernel.shape[1])
```

```

for i in tqdm(range(steps_height)):
    for j in range(steps_width):
        #print(input_array[i:kernel_size + i,j:kernel_size + j])
        try:
            if method == "dilate":
                if len(np.where((input_array[i:kernel_size +
i,j:kernel_size + j] == kernel) & ( input_array[i:kernel_size +
i,j:kernel_size + j] == pixel_value))[0]) > 0:
                    output_array[i,j] = pixel_value
            elif method == "erode":
                if len(np.where((input_array[i:kernel_size +
i,j:kernel_size + j] == kernel) & ( input_array[i:kernel_size +
i,j:kernel_size + j] == pixel_value))[0]) == len(np.where(kernel != 0)
[0]):
                    output_array[i,j] = pixel_value
            else:
                output_array[i,j] = 0
        except IndexError as e:
            print(e)

return output_array

```

```

input_array = np.array([[0,0,0,0,0],[0,1,1,0,0], [1,1,1,0,0],
[0,1,0,0,0], [0,0,0,0,0]])

```

```

output_array_dilate = apply_morphological_operators(input_array,
kernel,pixel_value = 1, method = "dilate")
output_array_erode = apply_morphological_operators(input_array,
kernel, pixel_value = 1, method = "erode")

```

padded input array

```

{"version_major":2,"version_minor":0,"model_id":"bfd6d6491c484b42b979d
74c8eb53037"}

```

padded input array

```

{"version_major":2,"version_minor":0,"model_id":"ad19116ae47a4f2fa9c3f
6cd93c0a6d6"}

```

output_array_dilate

```

array([[0, 1, 1, 0, 0],
       [1, 1, 1, 1, 0],
       [1, 1, 1, 1, 0],

```

```

        [1, 1, 1, 0, 0],
        [0, 1, 0, 0, 0]])

output_array_erode

array([[0, 0, 0, 0, 0],
       [0, 0, 0, 0, 0],
       [0, 1, 0, 0, 0],
       [0, 0, 0, 0, 0],
       [0, 0, 0, 0, 0]])

binarized_array = binarized_array[...,0]
output_array_dilate = apply_morphological_operators(binarized_array,
kernel = np.full((3,3), 255),pixel_value = 255, method = "dilate")
output_array_erode = apply_morphological_operators(binarized_array,
kernel = np.full((3,3), 255),pixel_value = 255, method = "erode")

padded input array
{"version_major":2,"version_minor":0,"model_id":"eedb1971e7874b3bb4417f4cc44a82c4"}

padded input array
{"version_major":2,"version_minor":0,"model_id":"c78fd9a334bc4a838509d1a1a37e6649"}

fig, ax = plt.subplots(1,4, figsize = (24,8))

ax[0].imshow(binarized_array, cmap = "gray")
ax[0].set_title("input image")

ax[1].imshow(output_array_dilate, cmap = "gray")
ax[1].set_title("dilated image")

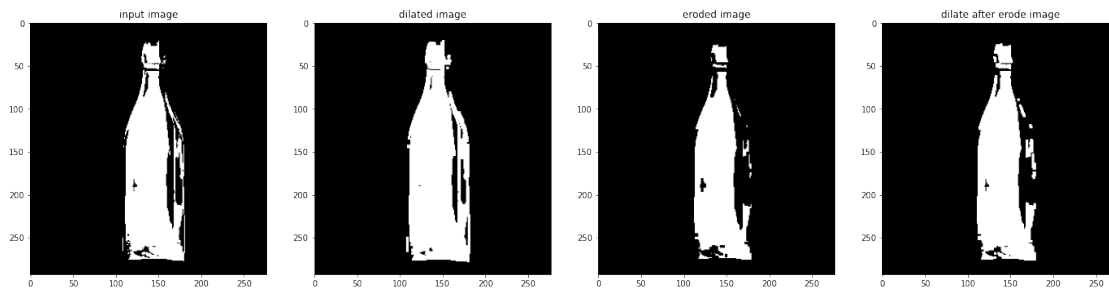
ax[2].imshow(output_array_erode, cmap = "gray")
ax[2].set_title("eroded image")

ax[3].imshow(apply_morphological_operators(output_array_erode, kernel
= np.full((3,3), 255),pixel_value = 255, method = "dilate"), cmap =
"gray")
ax[3].set_title("dilate after erode image")

padded input array
{"version_major":2,"version_minor":0,"model_id":"d0baa331cbaa4ead9a9832e9979928a8"}

Text(0.5, 1.0, 'dilate after erode image')

```



Connected components

Test on array from lecture

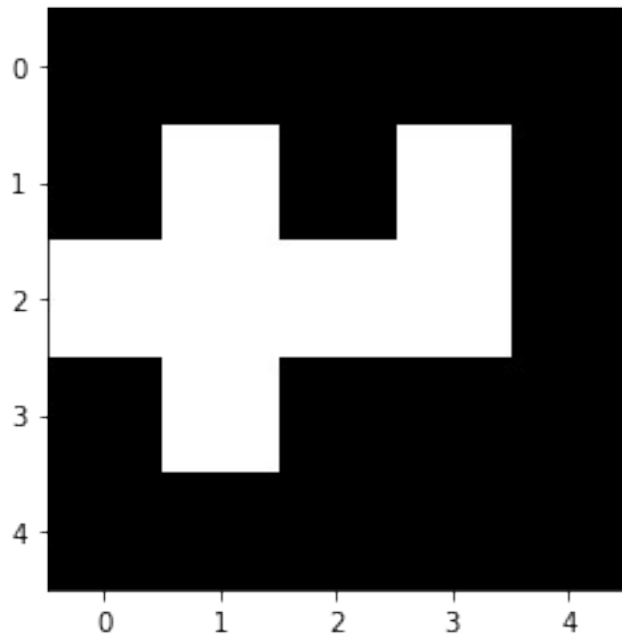
```
kernel = np.array([[0,1,0],[1,1,1],[0,1,0]])
print(kernel, "\n")
```

```
input_array = np.array([[0,0,0,0,0],[0,1,0,1,0], [1,1,1,1,0],
[0,1,0,0,0], [0,0,0,0,0]])
print(input_array)
plt.imshow(input_array, cmap = 'gray')
```

```
[[0 1 0]
 [1 1 1]
 [0 1 0]]
```

```
[[0 0 0 0 0]
 [0 1 0 1 0]
 [1 1 1 1 0]
 [0 1 0 0 0]
 [0 0 0 0 0]]
```

```
<matplotlib.image.AxesImage at 0x7f776c508280>
```

input_array

```
array([[0, 0, 0, 0, 0],
       [0, 1, 0, 1, 0],
       [1, 1, 1, 1, 0],
       [0, 1, 0, 0, 0],
       [0, 0, 0, 0, 0]])
```

```
input_array = np.array([[0,0,0,0,0],[0,1,0,1,0], [1,1,1,1,0],
                        [0,1,0,0,0], [0,0,0,0,0]])
```

input_array

```
array([[0, 0, 0, 0, 0],
       [0, 1, 0, 1, 0],
       [1, 1, 1, 1, 0],
       [0, 1, 0, 0, 0],
       [0, 0, 0, 0, 0]])
```

```
output_array = np.zeros_like(input_array)
```

output_array

```
array([[0, 0, 0, 0, 0],
       [0, 0, 0, 0, 0],
       [0, 0, 0, 0, 0],
       [0, 0, 0, 0, 0],
       [0, 0, 0, 0, 0]])
```

4-neighborhood

its value

```
output_array = first_pass(input_array)
output_array
```

```
{"version_major":2,"version_minor":0,"model_id":"3020b169e30d4786ad10d
b2ae63a7015"}
```

```
array([[0, 0, 0, 0, 0],
       [0, 1, 0, 2, 0],
       [3, 1, 1, 1, 0],
       [0, 1, 0, 0, 0],
       [0, 0, 0, 0, 0]])
```

Second pass

```
def second_pass(input_array: np.ndarray, kernel: np.ndarray) ->
np.ndarray:
```

```
    kernel_size = kernel.shape[0]
```

```
    output_2d_pass = np.copy(input_array)
    input_array = np.pad(input_array,1)
```

```
    steps_height = set_steps(input_array.shape[0], kernel.shape[0])
    steps_width = set_steps(input_array.shape[1], kernel.shape[1])
```

```
    for i in tqdm(range(steps_height)):
        for j in range(steps_width):
```

```
            not_background =
np.where((input_array[i:kernel_size+i,j:kernel_size+j]!=0) & (kernel !=
=0))
```

```
                if len(not_background[0]) > 0:
                    unique_labels_in_window =
np.unique(input_array[i:kernel_size+i,j:kernel_size+j])
                    label =
min(unique_labels_in_window[unique_labels_in_window!=0])
```

```
                    output_2d_pass[i:kernel_size+i,j:kernel_size+j]
[output_2d_pass[i:kernel_size+i,j:kernel_size+j] != 0] = label
```

```
    return output_2d_pass
```

```
output_2d_pass = second_pass(output_array, kernel)
output_2d_pass
```

```
{"version_major":2,"version_minor":0,"model_id":"8cd8e739dde34110b8a707d7c9e51b3c"}
```

```
array([[0, 0, 0, 0, 0],
       [0, 1, 0, 1, 0],
       [1, 1, 1, 1, 0],
       [0, 1, 0, 0, 0],
       [0, 0, 0, 0, 0]])
```

One-pass

```
def one_pass(input_array: np.ndarray, kernel: np.ndarray) ->
np.ndarray:

    kernel_size = kernel.shape[0]

    output_1_pass = np.zeros_like(input_array)

    input_array = np.pad(input_array,1)

    steps_height = set_steps(input_array.shape[0], kernel.shape[0])
    steps_width = set_steps(input_array.shape[1],kernel.shape[1])
    label = 1
    for i in tqdm(range(steps_height)):
        for j in range(steps_width):

            not_background =
np.where((input_array[i:kernel_size+i,j:kernel_size+j]!=0) & (kernel !=
=0))
            if len(not_background[0]) > 0:
                # check neighborhood , if some pixels are labeled,
take their label
                unique_labels_in_window = np.unique(output_1_pass[i +
not_background[0] - 1, j + not_background[1]-1])

                if
len(unique_labels_in_window[unique_labels_in_window!=0]) < 1:

                    output_1_pass[i + not_background[0] - 1, j +
not_background[1]-1] = label
                    label += 1
                else:
                    label_in_window =
min(unique_labels_in_window[unique_labels_in_window!=0])
```

```

        output_1_pass[i + not_background[0] - 1, j +
not_background[1]-1] = label_in_window

    # reliable sequentially
    for idx,i in enumerate(np.unique(output_1_pass)):
        output_1_pass[np.where(output_1_pass == i)] = idx

    return output_1_pass

output_1_pass = one_pass(input_array, kernel = np.ones((3,3)))
output_1_pass

{"version_major":2,"version_minor":0,"model_id":"0cbcd23a1d3945ed9cd76
cdf03ea2be2"}

array([[0, 0, 0, 0, 0],
       [0, 1, 0, 1, 0],
       [1, 1, 1, 1, 0],
       [0, 1, 0, 0, 0],
       [0, 0, 0, 0, 0]])

output_binarized_array_1st_pass = first_pass(binarized_array)

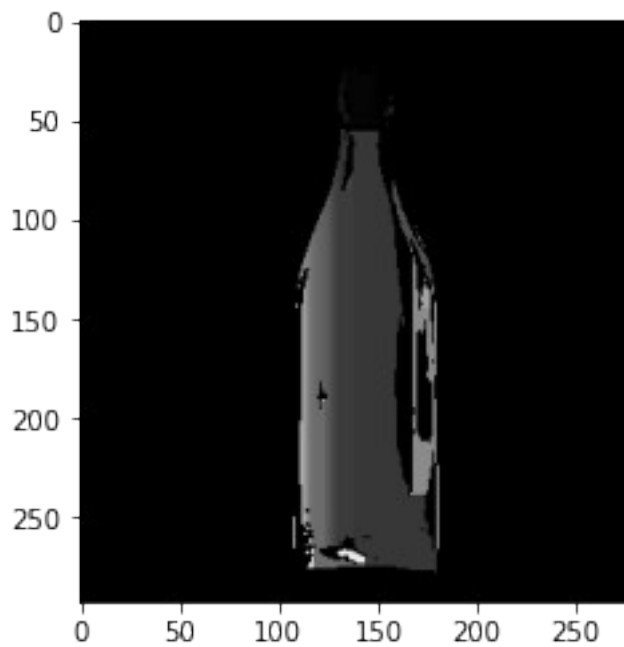
{"version_major":2,"version_minor":0,"model_id":"1d4b34fabf844e3e9afec
7930e9cd71a"}

output_binarized_array_2d_pass =
second_pass(output_binarized_array_1st_pass, kernel)

{"version_major":2,"version_minor":0,"model_id":"17a2c621479e47f4ac827
cef53cfa711"}

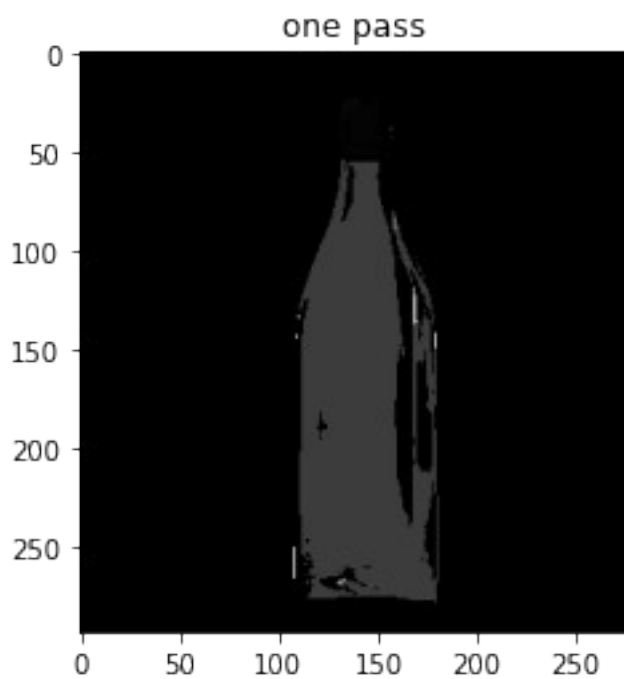
plt.imshow(output_binarized_array_2d_pass, cmap = 'gray')
<matplotlib.image.AxesImage at 0x7f77741141f0>

```



```
plt.imshow(one_pass(binarized_array, kernel = np.full((3,3),1)), cmap
= 'gray')
plt.title("one pass")
plt.show()
```

```
{"version_major":2,"version_minor":0,"model_id":"07425e610c51478a8464d
b561df6d1ad"}
```



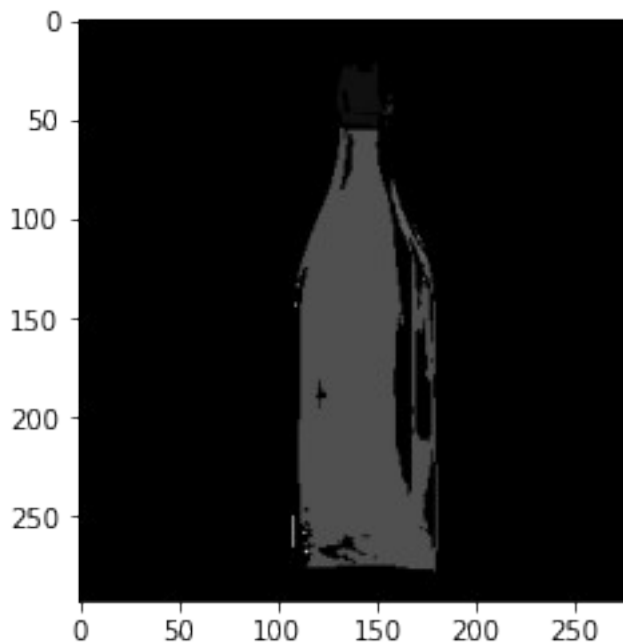
baseline, opencv-python

```
import cv2
```

```
num_labels, labels = cv2.connectedComponents(binarized_array)
```

```
plt.imshow(labels, cmap = 'gray')
```

```
<matplotlib.image.AxesImage at 0x7f776e7320d0>
```



Extract bounding box

dilate with large kernel to make a solide picture

```
binarized_array_dilated =  
apply_morphological_operators(binarized_array, kernel = np.full((8,8),  
1),pixel_value = 1, method = "dilate")
```

```
plt.imshow(binarized_array_dilated , cmap = 'gray')
```

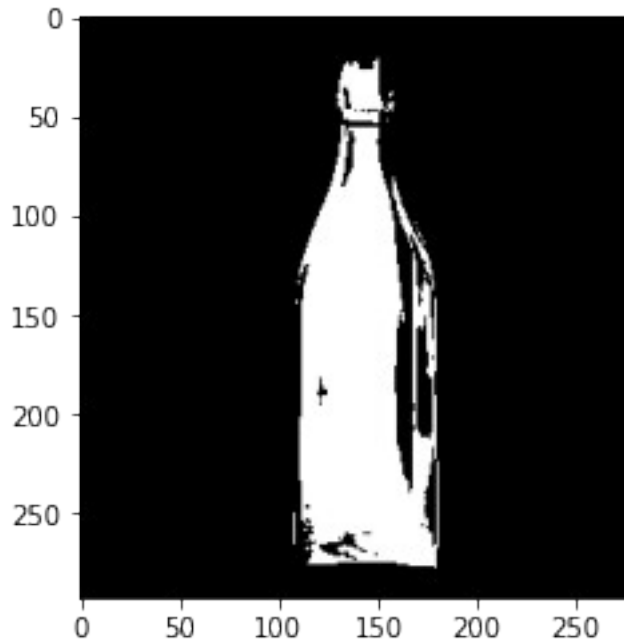
padded input array

```
{"version_major":2,"version_minor":0,"model_id":"739a68a300db47078a7ae  
c72ef90f8c8"}
```

```
/tmp/ipykernel_13169/3385474689.py:28: DeprecationWarning: elementwise  
comparison failed; this will raise an error in the future.
```

```
if len(np.where((input_array[i:kernel_size + i,j:kernel_size + j] ==  
kernel) & ( input_array[i:kernel_size + i,j:kernel_size + j] ==  
pixel_value))[0]) > 0:
```

```
<matplotlib.image.AxesImage at 0x7f7767849df0>
```



bounding box over dilated image

```
def draw_bbox(input_image : np.ndarray, over_label: int = -1,
return_only_bbox : bool = False) -> np.ndarray:
```

```
    output_image = np.copy(input_image)
    labels = np.unique(input_image)
```

draw over particular label

```
    if over_label != -1:
        labels = [0,over_label]
```

```
    for i in tqdm(labels[1::]):
        indices = np.where(input_image == i)
```

```
        top = max(indices[0])
        left = min(indices[1])
        bottom = min(indices[0])
        right = max(indices[1])
```

create dummy dataframe to simulate bounding box

if straight line

```
    if (right - left) == 0:
        # if just 1 pixel - skip it
```

```
        try:
            dummy_bbox = np.ones( (3, top-bottom+1)) -
```



```

np.pad(np.ones((1 , top-bottom -1 )),1)
        except ValueError:
            continue
    else:
        dummy_bbox = np.ones( (right-left +1, top-bottom+1)) -
np.pad(np.ones((right-left -1 , top-bottom -1 )),1)

    # indices of bbox
    indices = np.where(dummy_bbox == 1)

    # draw bbox
    output_image[indices[1] + bottom, indices[0] + left] = i

    # return bbox if not all labels selected (used in tracking later)
    if return_only_bbox and over_label != -1:
        only_bbox = np.zeros_like(input_image)
        only_bbox[indices[1] + bottom, indices[0] + left] = over_label
        return only_bbox

    return output_image

image_with_bbox = draw_bbox(binarized_array_dilated)

## Map component labels to hue val
# label_hue = np.uint8(179*image_with_bbox/np.max(image_with_bbox))
# blank_ch = 255*np.ones_like(label_hue)

# labeled_img = np.transpose(np.stack([label_hue, blank_ch,
blank_ch])), (1,2,0))

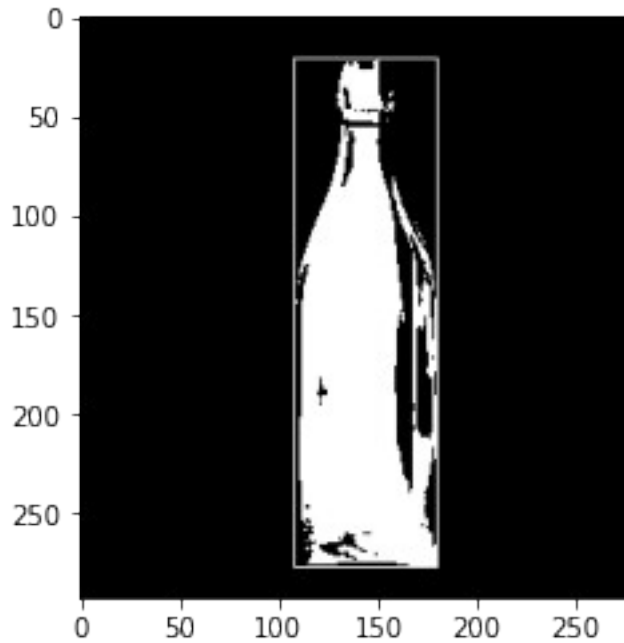
# labeled_img = color.hsv2rgb(labeled_img)
## set background label to black
# labeled_img[label_hue==0] = 0

plt.imshow(image_with_bbox)

{"version_major":2,"version_minor":0,"model_id":"926b7e72b6244c26959ec9dd6e238473"}

<matplotlib.image.AxesImage at 0x7f77677ceac0>

```



```
# draw bboxes after one-pass algorithm
image_with_bbox = draw_bbox(output_1_pass)

# Map component labels to hue val
label_hue = np.uint8(179*image_with_bbox/np.max(image_with_bbox))
blank_ch = 255*np.ones_like(label_hue)

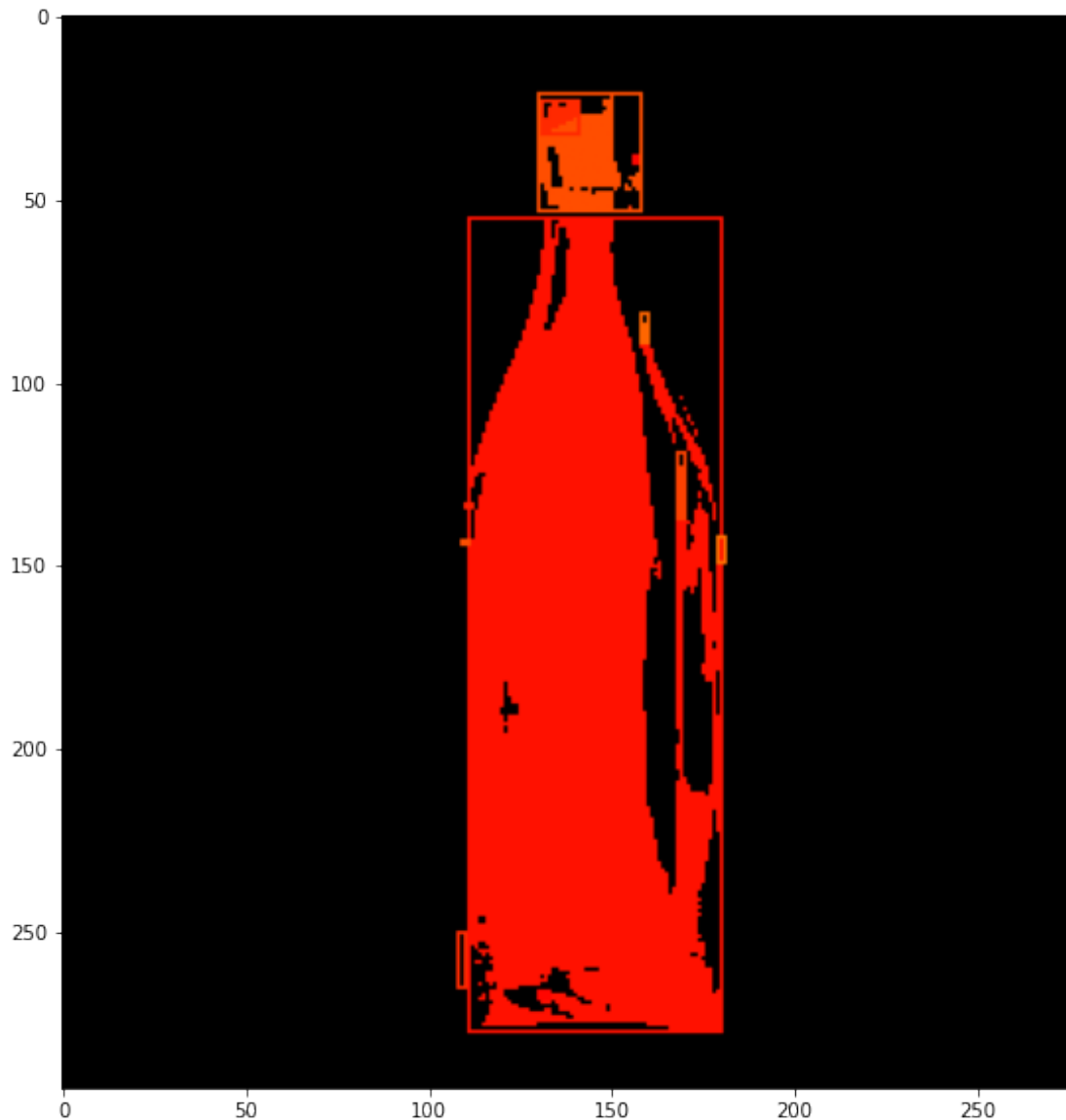
labeled_img = np.transpose(np.stack([label_hue, blank_ch, blank_ch]),
(1,2,0))

labeled_img = color.hsv2rgb(labeled_img)
# set background label to black
labeled_img[label_hue==0] = 0

plt.figure(figsize=(10,10))
plt.imshow(labeled_img)

{"version_major":2,"version_minor":0,"model_id":"a7a4078d6760476fb7837d382a08b9f8"}

<matplotlib.image.AxesImage at 0x7f776c458760>
```



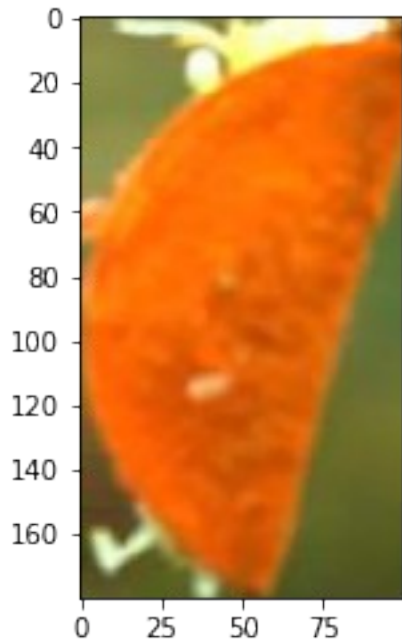
Exercise 1.3

- use your color detection and connected components algorithm
- implement simplest tracking algorithm
- draw history of all previous points on frame (**RESULT**)

(see images/racecar or images/taco for sample image sequences)

```
image = io.imread("images/taco/010.jpg")  
#plt.imshow(image)  
plt.imshow(image[170:350,0:100])
```

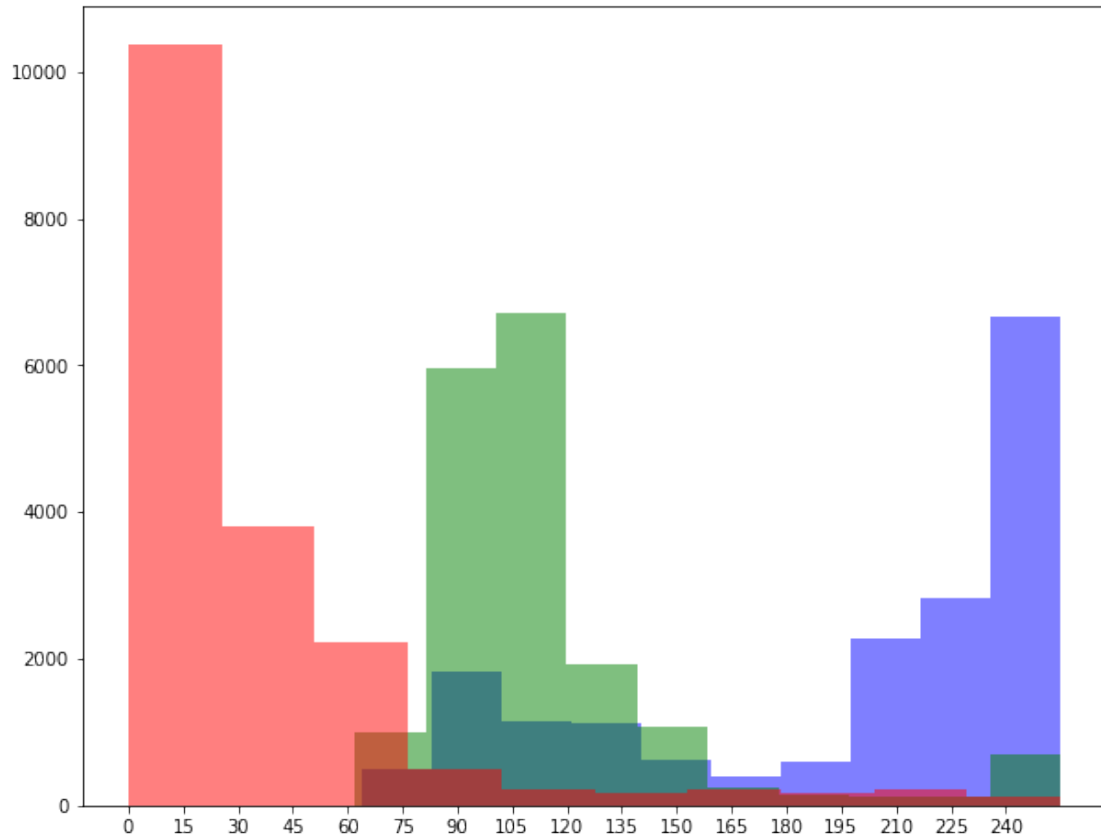
```
<matplotlib.image.AxesImage at 0x7f776ce92700>
```



```
# plot color distribution
plt.figure(figsize = (10,8))
colors = ["b","g","r"]

for idx,i in enumerate(colors):
    plt.hist(image[170:350,0:100,idx].flatten(), color = i, alpha =
0.5)
    plt.xticks(range(0,255,15))

plt.show()
```



```
def find_taco_label(input_array: np.ndarray) -> int:
    """
    we assume that after finding connected components based on our
    color threshold
    the "taco=label" will be most-represented ( will have highest
    number of pixels )
    """
    label_sizes = []
    # omit background
    for label in np.unique(input_array)[1:]:
        label_sizes.append(np.sum(one_pass_taco == label))
    return np.argmax(label_sizes) + 1

image.shape
(480, 854, 3)

import os

path_to_taco = os.path.join("images", "taco")

bboxes = []

for i in tqdm(os.listdir(path_to_taco)):
    path_to_image = os.path.join(path_to_taco, i)
```

```

image = io.imread(path_to_image)

# get taco
mask = np.where(((image[...,0] > 180) & (image[...,0] < 255)) &
((image[...,1] > 80) & (image[...,1] < 135)) & ((image[...,2] >
0)&(image[...,2] < 75)))
binarized_array = binarization(image, mask, used_dim = -1,
description = "dim 0 > 180 and < 255 AND dim 1 > 80 and < 135 AND dim
2 > 0 and < 75", plot = False)

# dilate with large kernel to make a solide view of taco
binarized_array_dilated =
apply_morphological_operators(binrized_array[...,0], kernel =
np.full((5,5), 1),pixel_value = 1, method = "dilate")

# find connected components
one_pass_taco = one_pass(binrized_array_dilated, kernel =
np.full((5,5), 1))

# get taco label
taco_label = find_taco_label(one_pass_taco)

# get bbox
only_bbox = draw_bbox(one_pass_taco, over_label = taco_label,
return_only_bbox=True)

bboxes.append(only_bbox)

{"version_major":2,"version_minor":0,"model_id":"a5dc17b4103a4ca5ac7d5
f52bd28d392"}

{"version_major":2,"version_minor":0,"model_id":"2efa7d2a4b934f299c113
4024c70bf47"}

{"version_major":2,"version_minor":0,"model_id":"a7a0bd485bfc473f95482
f9c84dd6b78"}

{"version_major":2,"version_minor":0,"model_id":"d6ad639aaf644f5f817f9
6775a1b00b1"}

{"version_major":2,"version_minor":0,"model_id":"4ec7ab0c15124cf2ba93c
cf3a40774b3"}

{"version_major":2,"version_minor":0,"model_id":"d3fecca9afed4ef2a3a25
11e7b844b09"}

{"version_major":2,"version_minor":0,"model_id":"8670d717885a4bc1a57f7
e6a1b4ced21"}

{"version_major":2,"version_minor":0,"model_id":"e6412c408d914a56bd532
d2bd1d5d2ff"}

```

```
{"version_major":2,"version_minor":0,"model_id":"51726a18937f43249e6033f26554d6f9"}

{"version_major":2,"version_minor":0,"model_id":"29a460dd83fd4acea0df18a8a00d8176"}

{"version_major":2,"version_minor":0,"model_id":"6c3063fa24944244a752a1cb9cfa7ec3"}

{"version_major":2,"version_minor":0,"model_id":"7e07e2de3a2c4a8a8410a0baaa2c5272"}

{"version_major":2,"version_minor":0,"model_id":"71527ddc5cdb4ec49423afb6f77c81ee"}

{"version_major":2,"version_minor":0,"model_id":"766f0cabf1c84c6c94d54aec254721e9"}

{"version_major":2,"version_minor":0,"model_id":"424ee39abf1248a28197f30c706fe8ba"}

{"version_major":2,"version_minor":0,"model_id":"5c7076fb84ba4ca6904bb5d073211c9d"}

{"version_major":2,"version_minor":0,"model_id":"482e7576a4b94104b17a1890f8942caa"}

{"version_major":2,"version_minor":0,"model_id":"396fcbcf0bec4ea6b095c5aac9bdeb4f"}

{"version_major":2,"version_minor":0,"model_id":"19ccd349c75a4828a540b4b9785e3384"}

{"version_major":2,"version_minor":0,"model_id":"4a1e16ea0e814d4a8547b276790552c2"}

{"version_major":2,"version_minor":0,"model_id":"358b68e8b4224cef8f3b1951933ff07c"}

{"version_major":2,"version_minor":0,"model_id":"86f9ff030eb1426ab91787d8dd3711f3"}

{"version_major":2,"version_minor":0,"model_id":"3dc94d465ba34d05b362d187a35cf546"}

{"version_major":2,"version_minor":0,"model_id":"978a71b3438644da9a5b5a493e3d569c"}

{"version_major":2,"version_minor":0,"model_id":"696a556c5bc64ec3831a0aa9e7cfc57e"}

{"version_major":2,"version_minor":0,"model_id":"003d9923e2594ba8b6b04226a480f00f"}
```

```
{"version_major":2,"version_minor":0,"model_id":"25802ff5a73b45c5a018b8cd1b14653b"}

{"version_major":2,"version_minor":0,"model_id":"c4642e06bd2947af821cf114acbe2692"}

{"version_major":2,"version_minor":0,"model_id":"bb733cdeff3043b58322bf050f16a19f"}

{"version_major":2,"version_minor":0,"model_id":"d71ca248004048c78cf07a53aaf4aaaa"}

{"version_major":2,"version_minor":0,"model_id":"a3a90c76261e4ad9b17b0b5f846721fa"}

{"version_major":2,"version_minor":0,"model_id":"6c355515750b4a7fba67106f9f7b0be6"}

{"version_major":2,"version_minor":0,"model_id":"da66b26c22ae496c9d266736e64b18f4"}

{"version_major":2,"version_minor":0,"model_id":"7559acb7748c4dadb4dc0091364a91b2"}

{"version_major":2,"version_minor":0,"model_id":"9972201de5824ada855d360296a57f37"}

{"version_major":2,"version_minor":0,"model_id":"1f5fce90d2324670adf078942cc02847"}

{"version_major":2,"version_minor":0,"model_id":"e94346aab45b4939b6275df02af977bb"}

{"version_major":2,"version_minor":0,"model_id":"18a81ace460242c8b00d5a91187b3abd"}

{"version_major":2,"version_minor":0,"model_id":"d931e86796104f998d4df5f2ea7d5ffc"}

{"version_major":2,"version_minor":0,"model_id":"951clae6acc3495780ca927455314f5e"}

{"version_major":2,"version_minor":0,"model_id":"03a333a184f74c4cabed4912e17fed31"}

{"version_major":2,"version_minor":0,"model_id":"b5bf593bf68444f59e06c7894ed28250"}

{"version_major":2,"version_minor":0,"model_id":"c01fe80cb6e64b039b96dd2f790b7c9e"}

{"version_major":2,"version_minor":0,"model_id":"01bc65a27dd54fd29e65b585c3e3ca49"}
```



```
{"version_major":2,"version_minor":0,"model_id":"5992d699f5d1469094437771dac5df12"}

{"version_major":2,"version_minor":0,"model_id":"fe37e2a832564f1db217d28251c4fdd5"}

{"version_major":2,"version_minor":0,"model_id":"9784ab7577924c1794b4573798b53e54"}

{"version_major":2,"version_minor":0,"model_id":"dad6f40313c54b05a73b3d9f9e4a76e1"}

{"version_major":2,"version_minor":0,"model_id":"56b31e244b7940e69964a7d54007ea30"}

{"version_major":2,"version_minor":0,"model_id":"15887424b47f4badb1527e575820942c"}

{"version_major":2,"version_minor":0,"model_id":"5e1d7edf9d1c42c48a632c86b835b4cb"}

{"version_major":2,"version_minor":0,"model_id":"4f879c4986b442d186f0263e131358f6"}

{"version_major":2,"version_minor":0,"model_id":"926ba6816b2b4e77b3c45ce293eaf389"}

{"version_major":2,"version_minor":0,"model_id":"4d033490a0c94229be8a994384ad59a6"}

{"version_major":2,"version_minor":0,"model_id":"7871aa138bc4444cacddb30f187baa57"}

{"version_major":2,"version_minor":0,"model_id":"773e7792b3f9477385ddd505833abb5f"}

{"version_major":2,"version_minor":0,"model_id":"439c32cf57fc44b597fb2d65aab707c4"}

{"version_major":2,"version_minor":0,"model_id":"5af62671776345b191cf6f772f4613d4"}

{"version_major":2,"version_minor":0,"model_id":"06ff878ae7c540dc9738d9f138e0f28b"}

{"version_major":2,"version_minor":0,"model_id":"f50eb72666d34ccd9c3f13a45c31ec82"}

{"version_major":2,"version_minor":0,"model_id":"5f7903e3e2e04490850e5db85fa5d744"}

{"version_major":2,"version_minor":0,"model_id":"4550d32bc9574dc993fa3220bfalb1c7"}
```

```
{"version_major":2,"version_minor":0,"model_id":"b8155ac549c9481f827fd  
d0321fae3e3"}  
  
{"version_major":2,"version_minor":0,"model_id":"28ca8a3d800041cd80438  
9cda0472de3"}  
  
{"version_major":2,"version_minor":0,"model_id":"e9af65b7ccbc4fe28da79  
d200881d9cf"}  
  
{"version_major":2,"version_minor":0,"model_id":"aad29164586e48bba7b2a  
354365979c7"}  
  
{"version_major":2,"version_minor":0,"model_id":"91e8016d5540446292104  
39e55297c87"}  
  
{"version_major":2,"version_minor":0,"model_id":"36a2173cfc3747e98796f  
911721222ea"}  
  
{"version_major":2,"version_minor":0,"model_id":"4fb261ffbe03402cb9a85  
12d6026a0fb"}  
  
{"version_major":2,"version_minor":0,"model_id":"295496bd9b254de184a06  
e137e0flc8e"}  
  
{"version_major":2,"version_minor":0,"model_id":"2aa8d3e0ab0f416aa1e6f  
79c6fdec998"}  
  
{"version_major":2,"version_minor":0,"model_id":"1263eb8cf9584aeb4e8c  
88977bfae02"}  
  
{"version_major":2,"version_minor":0,"model_id":"20e1ae618f264f6fbele  
e4e1af57aa9"}  
  
{"version_major":2,"version_minor":0,"model_id":"017e6722befd430d82b4e  
435d38faad7"}  
  
{"version_major":2,"version_minor":0,"model_id":"6c32998ae19d4f8481a24  
c6c3405cddd"}  
  
{"version_major":2,"version_minor":0,"model_id":"ca7d37ec77b1472c96920  
b6d9cefd0e3"}  
  
{"version_major":2,"version_minor":0,"model_id":"1af7ec3a09b64a278bf6f  
be016ce3d13"}  
  
{"version_major":2,"version_minor":0,"model_id":"51ede02f11474f979bc97  
e162a0124f7"}  
  
{"version_major":2,"version_minor":0,"model_id":"4fc0336065044a4fb3443  
b98120a401f"}  
  
{"version_major":2,"version_minor":0,"model_id":"07050d03c0aa4bd7ac1c7  
37a4982f933"}
```

```
{"version_major":2,"version_minor":0,"model_id":"f3542653adb84bfa93810345e81389fd"}

{"version_major":2,"version_minor":0,"model_id":"216a633438ca482389393d450c24273f"}

{"version_major":2,"version_minor":0,"model_id":"2cbb7df5f5664a89b00e97f8768c0614"}

{"version_major":2,"version_minor":0,"model_id":"50b38e50e6144d4083374029780d57a2"}

{"version_major":2,"version_minor":0,"model_id":"7fb816231be5437f850dd8749044feb1"}

{"version_major":2,"version_minor":0,"model_id":"c7198717c0e44c40afa49d86284c479e"}

{"version_major":2,"version_minor":0,"model_id":"e4bcc6317815466f89f973979e2ab237"}

{"version_major":2,"version_minor":0,"model_id":"9228ad912c2e4e66ba17bd7bf6615cea"}

{"version_major":2,"version_minor":0,"model_id":"94c17328ee844e0ab1423adb2892a376"}

{"version_major":2,"version_minor":0,"model_id":"c6ad7c4e37f5460882d9c84f05e9087a"}

{"version_major":2,"version_minor":0,"model_id":"48fc4f2103b64dc4b5e5699dddd2e04b"}

{"version_major":2,"version_minor":0,"model_id":"48cdc09c476141cfa83ec208b762f75"}

{"version_major":2,"version_minor":0,"model_id":"2d0c37b51c9c4c85b3e45374813d1fd2"}

{"version_major":2,"version_minor":0,"model_id":"5eeaed987ef7448cbd5b1ab420b284a9"}

{"version_major":2,"version_minor":0,"model_id":"41a9e17a41ff425ea1e8e208bc90969c"}

{"version_major":2,"version_minor":0,"model_id":"9a4e6aba9e18413f9dce6cdbc0b084c"}

{"version_major":2,"version_minor":0,"model_id":"0e07bbd5b3ae4baaacb9d7adelac16b6"}

{"version_major":2,"version_minor":0,"model_id":"2b15f9fef55b4ded821d94e3f16ada7f"}
```

```
{"version_major":2,"version_minor":0,"model_id":"0d35c5542b134621aded  
a081a64ca11c"}
```

```
{"version_major":2,"version_minor":0,"model_id":"8748a958e0774ece81b6b  
42b3bf50d25"}
```

```
{"version_major":2,"version_minor":0,"model_id":"05e74227a7384165aea11  
cc4d210ac00"}
```

```
{"version_major":2,"version_minor":0,"model_id":"249f415baab34cb1aef56  
0d50eee8792"}
```

```
{"version_major":2,"version_minor":0,"model_id":"19dd772af7f9457fa3e32  
1975ea05504"}
```

```
{"version_major":2,"version_minor":0,"model_id":"21e79a502cf540de9f73b  
b0181946ef6"}
```

```
{"version_major":2,"version_minor":0,"model_id":"9f22730d9ea04f39a6e44  
dd7a6e12531"}
```

```
{"version_major":2,"version_minor":0,"model_id":"35beeaceb2f149ba817b9  
c4208c344d1"}
```

```
{"version_major":2,"version_minor":0,"model_id":"3f615a58ea174a9594c46  
a1b94099112"}
```

```
{"version_major":2,"version_minor":0,"model_id":"40e7ff8af3f4411bbc7fb  
524ddfb2e3b"}
```

```
{"version_major":2,"version_minor":0,"model_id":"789b8df701f8432fbde46  
650749cd047"}
```

```
{"version_major":2,"version_minor":0,"model_id":"9151c39f0f644a5897af2  
90e03520c1a"}
```

```
{"version_major":2,"version_minor":0,"model_id":"739088e8454c44fd9e339  
f1e7c51e78c"}
```

```
{"version_major":2,"version_minor":0,"model_id":"466811ea9d2f4ba492356  
eb78d425a41"}
```

```
{"version_major":2,"version_minor":0,"model_id":"cf8883e105d3459e9ea8b  
1ef2116a962"}
```

```
{"version_major":2,"version_minor":0,"model_id":"5b20ab68e28b40e98683f  
c6448473b72"}
```

```
{"version_major":2,"version_minor":0,"model_id":"c1510c03f8934a8cbbbfd  
f52366e7021"}
```

```
{"version_major":2,"version_minor":0,"model_id":"dd8f86d86fba4d2099a98  
b42b91f5ec4"}
```

```
{"version_major":2,"version_minor":0,"model_id":"a49aa0f0b0cd42fbaa418224eb60757c"}

{"version_major":2,"version_minor":0,"model_id":"e60ba856a59a4d868fa33851106c0bb9"}

{"version_major":2,"version_minor":0,"model_id":"13ba60102dcb42e0bf90defc870flaa1"}

{"version_major":2,"version_minor":0,"model_id":"7aed5alb5bd54657ba1ecac7bael80d3"}

{"version_major":2,"version_minor":0,"model_id":"87ad162dd4554c06949f4700e9433a9b"}

{"version_major":2,"version_minor":0,"model_id":"e188e20014d7459eb299881020c0a3ad"}

{"version_major":2,"version_minor":0,"model_id":"c0cdd66e5a094b97b087428fa28af66a"}

{"version_major":2,"version_minor":0,"model_id":"87f60b6bc482492589f401606f11de14"}

{"version_major":2,"version_minor":0,"model_id":"720f1d147da34fd183e86494047d5f5f"}

{"version_major":2,"version_minor":0,"model_id":"908dd62fd66b4aefbd53e84b77202ed8"}

{"version_major":2,"version_minor":0,"model_id":"cc796865b85c489694458b23f2f8e250"}

{"version_major":2,"version_minor":0,"model_id":"c12a03a5b16d4bf18e78a21327a39355"}

{"version_major":2,"version_minor":0,"model_id":"9ce1de450227428b968d2316414baf8e"}

{"version_major":2,"version_minor":0,"model_id":"f11b7084f4f04b91bdae4ca19984953e"}

{"version_major":2,"version_minor":0,"model_id":"b80f201690934a739d86fcbbaed7d182"}

{"version_major":2,"version_minor":0,"model_id":"dab6ee67552f47e984c25efa541feab1"}

{"version_major":2,"version_minor":0,"model_id":"7811ac8af2d74a3e9b99a8ec578e460e"}

{"version_major":2,"version_minor":0,"model_id":"54c0050282f84880a46c03c4dd36a296"}
```

```
{"version_major":2,"version_minor":0,"model_id":"f5698c43c730439799a763a901d980f8"}

{"version_major":2,"version_minor":0,"model_id":"72785454025c4fc6974b54c0344b27de"}

{"version_major":2,"version_minor":0,"model_id":"a5a5475ecc164a54b2ffd9857b9f8998"}

{"version_major":2,"version_minor":0,"model_id":"d55bf28bb8664c6dba93bc187b397112"}

{"version_major":2,"version_minor":0,"model_id":"d714093edfa04d989cfa1d9c57c22092"}

{"version_major":2,"version_minor":0,"model_id":"9455eaeb503c4ced80b313e00f9bfff0e"}

{"version_major":2,"version_minor":0,"model_id":"1461d560bf7445c68f3449f0db55e56a"}

{"version_major":2,"version_minor":0,"model_id":"de73ee8ca914468198f959991d8042b4"}

{"version_major":2,"version_minor":0,"model_id":"ba603cefdc2741a5bd7ff41818f4434c"}

{"version_major":2,"version_minor":0,"model_id":"066a4b7ee992474c86236e1224ccddcb"}

{"version_major":2,"version_minor":0,"model_id":"2f504226c4c5493f82384a97bdf19b36"}

{"version_major":2,"version_minor":0,"model_id":"9a1be3bc20e44b4c8729f149d36272eb"}

{"version_major":2,"version_minor":0,"model_id":"a331cec8f5cd4cd78ebac5b175b10c67"}

{"version_major":2,"version_minor":0,"model_id":"e0f3c7b43d3b4eb9822de4feb731b145"}

{"version_major":2,"version_minor":0,"model_id":"7463fa4308e84aa5be5085273aa3972c"}

{"version_major":2,"version_minor":0,"model_id":"60b3b79754914abb9bc7d7ed349048c5"}

{"version_major":2,"version_minor":0,"model_id":"9cada85629d04c409a407701ecece0e1"}

{"version_major":2,"version_minor":0,"model_id":"bab9686f9d014a309e580c767d64cdf8"}
```

```
{"version_major":2,"version_minor":0,"model_id":"6abcaaa4a79746eba8ca1b159d191da9"}
```

```
{"version_major":2,"version_minor":0,"model_id":"2de344d1f74149cb96d905a03aa548e7"}
```

```
{"version_major":2,"version_minor":0,"model_id":"53d8305c300949d1afe0bc1911e0f0ad"}
```

```
{"version_major":2,"version_minor":0,"model_id":"2c2e59f62d1349a2991b764f8e757508"}
```

```
{"version_major":2,"version_minor":0,"model_id":"8c1bea3cb3084f1fa4a459232fdef6b7"}
```

```
{"version_major":2,"version_minor":0,"model_id":"09bcd1067be74464874612ea588dbb74"}
```

```
{"version_major":2,"version_minor":0,"model_id":"636bfbae31e0443f8bee3c0d874b2195"}
```

```
{"version_major":2,"version_minor":0,"model_id":"78a74190cc4240feb3be310c85da6778"}
```

```
{"version_major":2,"version_minor":0,"model_id":"e53c1ac0ba8b4e7490924cfe2e2d95f6"}
```

```
{"version_major":2,"version_minor":0,"model_id":"f0aeb446aa2f4ec2b5a8f0a130018552"}
```

```
{"version_major":2,"version_minor":0,"model_id":"4a76bcbf4c4642349de25d6f8e382abf"}
```

```
{"version_major":2,"version_minor":0,"model_id":"726b64300eb34f54aeaea77386b7a633"}
```

```
{"version_major":2,"version_minor":0,"model_id":"7cd3c9d8f9224b08b045c4318e56123e"}
```

```
{"version_major":2,"version_minor":0,"model_id":"99474de47456428b89c2a4d6d10c50c1"}
```

```
{"version_major":2,"version_minor":0,"model_id":"5b0425299895440ab8126eceb7f5ddf8"}
```

```
{"version_major":2,"version_minor":0,"model_id":"7e747b3d33744e509b570153b51ff84b"}
```

```
{"version_major":2,"version_minor":0,"model_id":"8982526ff16c4c3a91fe3e05fd336c9b"}
```

```
{"version_major":2,"version_minor":0,"model_id":"6a5d7130a59940ff8cc7e3a4954100fd"}
```

```
{"version_major":2,"version_minor":0,"model_id":"65752d90777f420198e3e30949c7e93e"}

{"version_major":2,"version_minor":0,"model_id":"ad442b021c5944cb9875f4690ad54ad8"}

{"version_major":2,"version_minor":0,"model_id":"a383c07deef44e13b59752df3cade9a5"}

{"version_major":2,"version_minor":0,"model_id":"c15203267dfe4c52982d7bb538988054"}

{"version_major":2,"version_minor":0,"model_id":"6883273ccdf84f328573b16daa46a4bb"}

{"version_major":2,"version_minor":0,"model_id":"aa75ecfda4954402aabfa977e7d21685"}

{"version_major":2,"version_minor":0,"model_id":"0846e9203b204032a81b4ed3059a347d"}

{"version_major":2,"version_minor":0,"model_id":"784fae2bf3fa48f9b6a80d9457d4b09a"}

{"version_major":2,"version_minor":0,"model_id":"c2b33e626ce143a2a3f8c5f35930df9e"}

{"version_major":2,"version_minor":0,"model_id":"3c29f988c58e4a90a5b141daec955180"}

{"version_major":2,"version_minor":0,"model_id":"0f564b9473064696a5c9225811862812"}

{"version_major":2,"version_minor":0,"model_id":"42ee1084e9c04aa899df0d66601985b2"}

{"version_major":2,"version_minor":0,"model_id":"b9d1be6e5e5a43938546d4f8d227b977"}

{"version_major":2,"version_minor":0,"model_id":"6ccea74dacee4339aed03eb1a047f1f6"}

{"version_major":2,"version_minor":0,"model_id":"e1db2801218f4491800ff2059c2ffe8b"}

{"version_major":2,"version_minor":0,"model_id":"8ca7e8f7584f49b5adc61a69eccdd122"}

{"version_major":2,"version_minor":0,"model_id":"5136a4b3d8514a0a9b08f071a985a188"}

{"version_major":2,"version_minor":0,"model_id":"0e6eb5b9c8ac476291f52c7361f7f4c2"}
```



```
{"version_major":2,"version_minor":0,"model_id":"08fb9581e8b64c4f9e36f6e706b191ba"}

{"version_major":2,"version_minor":0,"model_id":"1571b7376b7e4a619d7f888e2cae8b42"}

{"version_major":2,"version_minor":0,"model_id":"fb7245f9d658453a8dc0d651feal46bd"}

{"version_major":2,"version_minor":0,"model_id":"2366920df3bc4e1eb73834dd22998450"}

{"version_major":2,"version_minor":0,"model_id":"e6707ac727b04457a20164f2ab629cfe"}

{"version_major":2,"version_minor":0,"model_id":"f19e5ed00ec34a8bb6106e3de6d2be76"}

{"version_major":2,"version_minor":0,"model_id":"7bcd81009fd946d194caa9276a86df6d"}

{"version_major":2,"version_minor":0,"model_id":"2996b4245eda45729a5ff702350c6328"}

{"version_major":2,"version_minor":0,"model_id":"8e2cfe911f4d4b1885a38a95f1405c14"}

{"version_major":2,"version_minor":0,"model_id":"648aaa9dc92e4c82b9ed1d363aedc437"}

{"version_major":2,"version_minor":0,"model_id":"048df89a28924f6c9139cd41a63a5c96"}

{"version_major":2,"version_minor":0,"model_id":"ab150b8afe2241c78e8c9d1c2d065d6d"}

{"version_major":2,"version_minor":0,"model_id":"419111edc86b4f1bb0f1478cf3106d3d"}

{"version_major":2,"version_minor":0,"model_id":"9e9014da21f54346b22516763dcc726b"}

{"version_major":2,"version_minor":0,"model_id":"01f93fe04d114ed28eb590dbf300bac2"}

{"version_major":2,"version_minor":0,"model_id":"7df339ac00dc499196bb04eac4cb5ee2"}

{"version_major":2,"version_minor":0,"model_id":"b25153f5f83a49659f938206818236e4"}

{"version_major":2,"version_minor":0,"model_id":"ccff6acdeefc4987a4fc099da26240f7"}
```

```
{"version_major":2,"version_minor":0,"model_id":"31024a7087fe45a781ded291d521805e"}

{"version_major":2,"version_minor":0,"model_id":"105cd3c284864bb799ade0d159c3f631"}

{"version_major":2,"version_minor":0,"model_id":"3de7bbe3b9d24deca0e6fadaa161291c"}

{"version_major":2,"version_minor":0,"model_id":"73c16dc9ab614a53ac668aa3df760ec1"}

{"version_major":2,"version_minor":0,"model_id":"2f0d9e26a5fa4d208670cd347ba73985"}

{"version_major":2,"version_minor":0,"model_id":"e6cd944348fe4a64be2cf1c6c628ce2f"}

{"version_major":2,"version_minor":0,"model_id":"0a9d568db85f48c6998861f253939496"}

{"version_major":2,"version_minor":0,"model_id":"0399a1d39b7743ab80adc ec27a46a457"}

{"version_major":2,"version_minor":0,"model_id":"faf21leefde041e19949abfde308a4fd"}

{"version_major":2,"version_minor":0,"model_id":"ad71c2c1537b4a0f95d1f47fd6530a2e"}

{"version_major":2,"version_minor":0,"model_id":"79be4db70de049e9b7be5b2be0bb9d18"}

{"version_major":2,"version_minor":0,"model_id":"ecf6e7f0ee734c42b095cb6ba56f3bcc"}

{"version_major":2,"version_minor":0,"model_id":"794ce66c15fa4287b8664439feb0ca27"}

{"version_major":2,"version_minor":0,"model_id":"927beble0042488fb149c70b31accfb2"}

{"version_major":2,"version_minor":0,"model_id":"fd58c2f573a94f1fb4ec60d708dd45e9"}

{"version_major":2,"version_minor":0,"model_id":"32bceb1445954997adc6d6439206ab2f"}

{"version_major":2,"version_minor":0,"model_id":"01fa88903b4c41cdaab525d907a80095"}

{"version_major":2,"version_minor":0,"model_id":"b9f3011c31934d74831abd3cc8c61ced"}
```

```
{"version_major":2,"version_minor":0,"model_id":"b9fdea8e4b1f40028db88f2059d7827b"}
```

```
{"version_major":2,"version_minor":0,"model_id":"4c8b34b04ec149c08457bc3089eefe93"}
```

```
{"version_major":2,"version_minor":0,"model_id":"db5f42c183384ccba5f3280d738c7d26"}
```

```
{"version_major":2,"version_minor":0,"model_id":"c7b1760ca14949e49661c968f269d7d5"}
```

```
{"version_major":2,"version_minor":0,"model_id":"affe9f6e6caa419daa10fd088e72a4d8"}
```

```
{"version_major":2,"version_minor":0,"model_id":"16f9f373abd741d8ae7900dle0f97661"}
```

```
{"version_major":2,"version_minor":0,"model_id":"52b0ec6230df4c4f82c69a4cd090f76f"}
```

```
{"version_major":2,"version_minor":0,"model_id":"f76ba51a07014dcbb228b43cc81c2746"}
```

```
{"version_major":2,"version_minor":0,"model_id":"d033f3f57f3c4fc8a9ac125086744ef5"}
```

```
{"version_major":2,"version_minor":0,"model_id":"eebcd18a518344078f7f4368495c8033"}
```

```
{"version_major":2,"version_minor":0,"model_id":"5edcb06d1eba40d390dd22cfc4da7c6a"}
```

```
{"version_major":2,"version_minor":0,"model_id":"53184d0a9c2d4310a71ea434e6876fe3"}
```

```
{"version_major":2,"version_minor":0,"model_id":"042d8345932a4858ad974df205e36754"}
```

```
{"version_major":2,"version_minor":0,"model_id":"d5519d9ed2a0479a9e64e9fed87440a"}
```

```
{"version_major":2,"version_minor":0,"model_id":"42fdfd843abc45c3b55e0bc67faf2664"}
```

```
{"version_major":2,"version_minor":0,"model_id":"a021c18c9b0a4d27bd17d6f0bdd6c2a5"}
```

```
{"version_major":2,"version_minor":0,"model_id":"10b621a297ef449daa093cc6bff93b75"}
```

```
{"version_major":2,"version_minor":0,"model_id":"b416d7471c60409381f9a8dbd27d7ca3"}
```

```
{"version_major":2,"version_minor":0,"model_id":"a34f968607394e149ba3014fce80eb8c"}

{"version_major":2,"version_minor":0,"model_id":"5998fab011a8411fab7379c53172e5f1"}

{"version_major":2,"version_minor":0,"model_id":"d4912168853d44ff94f05669caaa298a"}

{"version_major":2,"version_minor":0,"model_id":"e660a9292fd54a8aa9fa92b3adcb4e84"}

{"version_major":2,"version_minor":0,"model_id":"754007751cd844af99a502fdfa7ba4f3"}

{"version_major":2,"version_minor":0,"model_id":"70fa6b79398f4b1e9d0b688a3ea7da47"}

{"version_major":2,"version_minor":0,"model_id":"c211f12c2fe24397a335ae42da30721a"}

{"version_major":2,"version_minor":0,"model_id":"bccedc95452f4a0894b03c32cdf84842"}

{"version_major":2,"version_minor":0,"model_id":"1cdb956c48c5463d8563070bacca6241"}

{"version_major":2,"version_minor":0,"model_id":"3c707767dda840d8a81ffec4ceec9c3a"}

{"version_major":2,"version_minor":0,"model_id":"f5cbe3e9402d44f181dfb0b74aa9b32d"}

{"version_major":2,"version_minor":0,"model_id":"a49c5fa732924341926711dc426cd0c8"}

{"version_major":2,"version_minor":0,"model_id":"390dee07b9e04bab8c8458479da13427"}

{"version_major":2,"version_minor":0,"model_id":"31926beb6a744f02bd892d5f9d56c5cd"}

{"version_major":2,"version_minor":0,"model_id":"d0b43d27662c45b496ebf06aeb05c3ca"}

{"version_major":2,"version_minor":0,"model_id":"e254af2b9ac5402b893f13724e293bee"}

{"version_major":2,"version_minor":0,"model_id":"a69b489fb8f2442280e6632f04921352"}

{"version_major":2,"version_minor":0,"model_id":"ff2bf17aa6004f45a68be8695b0d2ae8"}
```

```
{"version_major":2,"version_minor":0,"model_id":"fcafla08a6f443a0b5e9b062b4155818"}

{"version_major":2,"version_minor":0,"model_id":"426a87973430400d93765c73736f3890"}

{"version_major":2,"version_minor":0,"model_id":"85b156508d284032be22747b19326c03"}

{"version_major":2,"version_minor":0,"model_id":"f764094f9d544f619347d1b2e7191838"}

{"version_major":2,"version_minor":0,"model_id":"ed669e6bb1a34852bd1e13de9a57a0a4"}

{"version_major":2,"version_minor":0,"model_id":"5ad09adf01254824acfd74ad9b2cf16"}

{"version_major":2,"version_minor":0,"model_id":"59744db03af94d7c89d2eefcbf983481"}

{"version_major":2,"version_minor":0,"model_id":"e2757842df8347d1ad175c017a5ale50"}

{"version_major":2,"version_minor":0,"model_id":"4fb21a180e84418fba200264d203756e"}

{"version_major":2,"version_minor":0,"model_id":"1d21a3ccecf144cf9aa4d69c69b5f9c4"}

{"version_major":2,"version_minor":0,"model_id":"40212fe832734855a3b2dc081539440"}

{"version_major":2,"version_minor":0,"model_id":"e52e0bb9ff644fb4a4def713a5fa59f1"}

{"version_major":2,"version_minor":0,"model_id":"82909b7f78b54268ae906f989dcbc8f8"}

{"version_major":2,"version_minor":0,"model_id":"e0f7e7765d5943c3a7ebeb616f75a324"}

{"version_major":2,"version_minor":0,"model_id":"19a325e3b66240c89525bebfd87ca096"}

{"version_major":2,"version_minor":0,"model_id":"c0f0b7af713945ec952f925ff3702ed9"}

{"version_major":2,"version_minor":0,"model_id":"6b533c188ecc4c839d57b7ccd38236ea"}

{"version_major":2,"version_minor":0,"model_id":"f636cf8cb9a849f5b6bfff19fdb80d53a"}
```

```
{"version_major":2,"version_minor":0,"model_id":"da22b3f14cdd4c578b0d7a3d4231994a"}

{"version_major":2,"version_minor":0,"model_id":"c1c2c7cd79f64ebaa9e691617d92cf7c"}

{"version_major":2,"version_minor":0,"model_id":"626d50beb4cb444694cdf66c0058d066"}

{"version_major":2,"version_minor":0,"model_id":"d4848f9653fc4c1ebcb70040805d10cc"}

{"version_major":2,"version_minor":0,"model_id":"0c466e6153dc42918ff39dele4945dbc"}

{"version_major":2,"version_minor":0,"model_id":"c21e3a6e2cc4494fa8eaddce2f9de6b5"}

{"version_major":2,"version_minor":0,"model_id":"5ca6931435d8432ba759012e1d880050"}

{"version_major":2,"version_minor":0,"model_id":"f9e2d9587cd74053af512549ad062f47"}

{"version_major":2,"version_minor":0,"model_id":"658d0cd41eaf4c7e94c806585de2e5a8"}

{"version_major":2,"version_minor":0,"model_id":"ab61493e734e46aa84f29be2ddc303d0"}

{"version_major":2,"version_minor":0,"model_id":"b039edc72369456f8a43437e3354ba02"}

{"version_major":2,"version_minor":0,"model_id":"8827988b8de34572b6cd4782bd08cfl e"}

{"version_major":2,"version_minor":0,"model_id":"e5330f5232bf4d0395026e751bf5290e"}

{"version_major":2,"version_minor":0,"model_id":"d4d2b5a4a94c447db389dfc510b0b30f"}

{"version_major":2,"version_minor":0,"model_id":"7c5e78feb94248a5a1c73b1dd2e0d8c9"}

{"version_major":2,"version_minor":0,"model_id":"1ef6c55007fd4eff85f84f38c599d81f"}

{"version_major":2,"version_minor":0,"model_id":"b083e32592924204a41e48e57af82901"}

{"version_major":2,"version_minor":0,"model_id":"a8b516f90b6c4ce08b8e1a8344b3bde0"}
```

```
{"version_major":2,"version_minor":0,"model_id":"3578e34f93674995804ea  
aa8145c87fb"}  
  
{"version_major":2,"version_minor":0,"model_id":"5ec0e2cf0cdd48dc91ba5  
a07c0f7db21"}  
  
{"version_major":2,"version_minor":0,"model_id":"4103a3cb2e2640e489708  
fd0d84ceba3"}  
  
{"version_major":2,"version_minor":0,"model_id":"4da5979d337f41f0963ea  
d5c2fe9aa7c"}  
  
{"version_major":2,"version_minor":0,"model_id":"c45c0b35a2ff49f59afdf  
70921355d62"}  
  
{"version_major":2,"version_minor":0,"model_id":"8c7f71ab2f9b48659aa3b  
915fcc711f1"}  
  
{"version_major":2,"version_minor":0,"model_id":"d71aceecde734a5d99e6e  
c89c7d61a9e"}  
  
{"version_major":2,"version_minor":0,"model_id":"c3569b559e634d64b2df4  
03d16e2cd20"}  
  
{"version_major":2,"version_minor":0,"model_id":"775b677c0c6041acb13f7  
b9f40ba402f"}  
  
{"version_major":2,"version_minor":0,"model_id":"8e5afbcbd9d74e4da6414  
6a2c5b11efa"}  
  
{"version_major":2,"version_minor":0,"model_id":"17c51a7a03a14cb2b5e5f  
aadafd6ca3"}  
  
{"version_major":2,"version_minor":0,"model_id":"8505010f4df54039a5193  
6b78689ea6a"}  
  
{"version_major":2,"version_minor":0,"model_id":"1dc7d3ef54d44667bc799  
6ae849c9623"}  
  
{"version_major":2,"version_minor":0,"model_id":"c75d510eaf4c48dea10dc  
32c915d9570"}  
  
{"version_major":2,"version_minor":0,"model_id":"647e626cc191424ca7f02  
09ca928f94f"}  
  
{"version_major":2,"version_minor":0,"model_id":"c20fcc0747e2423b92775  
1d21395a2e4"}  
  
{"version_major":2,"version_minor":0,"model_id":"566116b45cab4b42bc254  
6c7c69d17da"}  
  
{"version_major":2,"version_minor":0,"model_id":"cdac4f94f3024335a2efc  
2ada1045d9e"}
```

```
{"version_major":2,"version_minor":0,"model_id":"6139861f0ffe4d2b931e084d08b14ae9"}

{"version_major":2,"version_minor":0,"model_id":"77c38f683b224ee490da76d09ef553e8"}

{"version_major":2,"version_minor":0,"model_id":"bef0424a3d5c47af9a10c8bb729464b0"}

{"version_major":2,"version_minor":0,"model_id":"16f68827a59c408196d0166ecc3686ab"}

{"version_major":2,"version_minor":0,"model_id":"d708da05f24d45d4aa4efc4e4dddc0c7"}

{"version_major":2,"version_minor":0,"model_id":"708fd53d939642e7a2993c0c85944c52"}

{"version_major":2,"version_minor":0,"model_id":"f2bc5185e18b49c5b0fc39fd36b3c2cc"}

{"version_major":2,"version_minor":0,"model_id":"15010f22e86e4c5ea5e61f728310bc43"}

{"version_major":2,"version_minor":0,"model_id":"d441a62329694cf0a2c4d7ed1be3fe05"}

{"version_major":2,"version_minor":0,"model_id":"acdb4110e54e45d9a4a89b19c537a4de"}

{"version_major":2,"version_minor":0,"model_id":"fcec1f692e1a4ebb9133de9a680ff6dc"}

{"version_major":2,"version_minor":0,"model_id":"a7bfc8222ffe4528bcab523b06a855b3"}

{"version_major":2,"version_minor":0,"model_id":"33a0f76d731e4d23abbd5dac898e8bd1"}

{"version_major":2,"version_minor":0,"model_id":"ba52bc289f5447fba2da3134a1816ed6"}

{"version_major":2,"version_minor":0,"model_id":"725870ee61e2425c8ad474ef4cf5a853"}

{"version_major":2,"version_minor":0,"model_id":"dc0c8c3856e94d9d96c23d22a4dfd9b2"}

{"version_major":2,"version_minor":0,"model_id":"92c715792a0d498fb1142f97d6caf32b"}

{"version_major":2,"version_minor":0,"model_id":"09e6aa1d0b704a7cb841927274764711"}
```



```
{"version_major":2,"version_minor":0,"model_id":"9c6a1ec865c645eea7a2a  
ab84432aa89"}
```

```
{"version_major":2,"version_minor":0,"model_id":"f88f5b65d8124fa3b6fcf  
ac8a8ca5d66"}
```

```
{"version_major":2,"version_minor":0,"model_id":"da4eeb0670314ff98655d  
be810f65853"}
```

```
{"version_major":2,"version_minor":0,"model_id":"e3b5794a428d45928f08e  
536581db22f"}
```

```
{"version_major":2,"version_minor":0,"model_id":"5bc1d9722a4d4a27a5e14  
d96952603e7"}
```

```
{"version_major":2,"version_minor":0,"model_id":"621c687899194086986b5  
48dea43c72f"}
```

```
{"version_major":2,"version_minor":0,"model_id":"08020cd78b674813bce66  
83d27307569"}
```

```
{"version_major":2,"version_minor":0,"model_id":"0bc5452453d44b83b26d4  
allef00cb9d"}
```

```
{"version_major":2,"version_minor":0,"model_id":"985d5cd0d64846ceadd01  
eee6a51877d"}
```

```
{"version_major":2,"version_minor":0,"model_id":"16740381090248c08930e  
37749a71db3"}
```

```
{"version_major":2,"version_minor":0,"model_id":"9f5f0a01bcc64e1c9cf6e  
0f3f96885cb"}
```

```
{"version_major":2,"version_minor":0,"model_id":"2fd98a427e994ac89e086  
1980d6f33eb"}
```

```
{"version_major":2,"version_minor":0,"model_id":"946ffb010f4a44f48c283  
49c5f62fe39"}
```

```
{"version_major":2,"version_minor":0,"model_id":"1b1402670eec484e8d3a2  
87445458e12"}
```

```
{"version_major":2,"version_minor":0,"model_id":"11f30ca0cb9247a796cad  
141bf471360"}
```

```
{"version_major":2,"version_minor":0,"model_id":"a3a3ffdbee684cb088ac7  
e50d5ed0444"}
```

```
{"version_major":2,"version_minor":0,"model_id":"2c593a79568546fea8c5b  
ae6ff4b1b8a"}
```

```
{"version_major":2,"version_minor":0,"model_id":"e1d74e15215e42bca94c1  
6ac0d511c55"}
```

```
{"version_major":2,"version_minor":0,"model_id":"327e6f871b794345b1cf0f549c3161de"}

{"version_major":2,"version_minor":0,"model_id":"5fda06f933cb4d5285f3d0582bb406fb"}

{"version_major":2,"version_minor":0,"model_id":"b6ffc3996bcc4ed09da5efdf37837895"}

{"version_major":2,"version_minor":0,"model_id":"9f9705441d664aa9ae31381c319ed6e8"}

{"version_major":2,"version_minor":0,"model_id":"034f277f8b4a47e4af8b9f1c63006dc4"}

{"version_major":2,"version_minor":0,"model_id":"fdc538c66d73491497b3d9e6420bfl0"}

{"version_major":2,"version_minor":0,"model_id":"aa442c4fca304da1b786b49989681c61"}

{"version_major":2,"version_minor":0,"model_id":"a55a316eb96c466fafbcdaf2ca70d021"}

{"version_major":2,"version_minor":0,"model_id":"5ed3706d76dc430bb30993a2c797e4ef"}

{"version_major":2,"version_minor":0,"model_id":"0af25524812844c1acd19cc17afc3b24"}

{"version_major":2,"version_minor":0,"model_id":"ea45d674a847483e86e1f51cdfab8b48"}

{"version_major":2,"version_minor":0,"model_id":"1eaa2628aef2437795238febabec160d"}

{"version_major":2,"version_minor":0,"model_id":"88ab1020d6c64b56835d33de2a66749d"}

{"version_major":2,"version_minor":0,"model_id":"2b3ca2394c684903b7ff2dd9d6fbbbed"}

{"version_major":2,"version_minor":0,"model_id":"1c10213337e44341a89ba8e5c5cc0c01"}

{"version_major":2,"version_minor":0,"model_id":"e4c06c3b5d3d4b62b50612f1ebbcddd5"}

{"version_major":2,"version_minor":0,"model_id":"de6e1c1638e548a583d8f0217836635f"}

{"version_major":2,"version_minor":0,"model_id":"9ba120dc2acb4931b7c291f53fd3e258"}
```

```
{"version_major":2,"version_minor":0,"model_id":"be2f0166525e417fb2b1945c2046dd47"}

{"version_major":2,"version_minor":0,"model_id":"c3ffd99ec7414ee1a25d92f21ce8abc5"}

{"version_major":2,"version_minor":0,"model_id":"41ad4cc37e144aec943b79952be6d42c"}

{"version_major":2,"version_minor":0,"model_id":"c8aef250a15d4bec9e1757471daddf17"}

{"version_major":2,"version_minor":0,"model_id":"3dcecb21fbe44fec857585a0acac8e46"}

{"version_major":2,"version_minor":0,"model_id":"51eea8b1ba60450fa9620efcf3e094bc"}

{"version_major":2,"version_minor":0,"model_id":"6963a5cff6ac4f329c35d553f17d186a"}

{"version_major":2,"version_minor":0,"model_id":"c176bdabcee041fdae11a1128f5ac2e0"}

{"version_major":2,"version_minor":0,"model_id":"a4ceale0916a4f08a4beb8b3e6f97cdb"}

{"version_major":2,"version_minor":0,"model_id":"dc4591e856294c1cb8ee1c3effe66993"}

{"version_major":2,"version_minor":0,"model_id":"37e3fe3235f84448a6988416af02e881"}

{"version_major":2,"version_minor":0,"model_id":"c038d40d44fa4920be41c16c0413a579"}

{"version_major":2,"version_minor":0,"model_id":"dd88f44704d8457a924ef3c5a036a85b"}

{"version_major":2,"version_minor":0,"model_id":"ba9fe849f10a4a87b7f839d2c625f98d"}

{"version_major":2,"version_minor":0,"model_id":"28e39dad65834e20bf2f78a7cc541544"}

{"version_major":2,"version_minor":0,"model_id":"9c5b6def32f430da64cae8386ff7c3"}

{"version_major":2,"version_minor":0,"model_id":"17fe9732a8524b9a93d1d9ce7a5b7ee1"}

{"version_major":2,"version_minor":0,"model_id":"1b301515f7e44c7d95784410742299e6"}
```

```
{"version_major":2,"version_minor":0,"model_id":"36c34be2c4ea47938111b  
eaa18c075ef"}  
  
{"version_major":2,"version_minor":0,"model_id":"300af95924e04098af6c5  
a2aea3ff0a0"}  
  
{"version_major":2,"version_minor":0,"model_id":"8fde2e27e6594f55b852f  
bf677b561fa"}  
  
{"version_major":2,"version_minor":0,"model_id":"e701dcb631d24b809829b  
e311bf15c0c"}  
  
{"version_major":2,"version_minor":0,"model_id":"ab6596de395449bead7f7  
0683a88ed2f"}  
  
{"version_major":2,"version_minor":0,"model_id":"16b6ef70c3e047818c9ff  
f107292f780"}  
  
{"version_major":2,"version_minor":0,"model_id":"4c0e0b23fda843c280976  
e531268fe32"}  
  
{"version_major":2,"version_minor":0,"model_id":"2af7f0103ab24772812e1  
b747ef73451"}  
  
{"version_major":2,"version_minor":0,"model_id":"a5565633d81c4e939fbbf  
cc4d89f0f52"}  
  
{"version_major":2,"version_minor":0,"model_id":"08bcc728d1784d3f9c17d  
39c74c9757f"}  
  
{"version_major":2,"version_minor":0,"model_id":"71a87fe741ff4c0ba1ba8  
329df8eadd0"}  
  
{"version_major":2,"version_minor":0,"model_id":"e2c60dced9e446dead1a5  
85e110cced5"}  
  
{"version_major":2,"version_minor":0,"model_id":"60b4437493ae4b72936f9  
c925c338304"}  
  
{"version_major":2,"version_minor":0,"model_id":"ade7d801fec649378501e  
9965465c93c"}  
  
{"version_major":2,"version_minor":0,"model_id":"66c382c6947940dbb0d25  
fe5e2290f23"}  
  
{"version_major":2,"version_minor":0,"model_id":"7a7e022f29634e408d071  
2cd0dc2a944"}  
  
{"version_major":2,"version_minor":0,"model_id":"9ccb8914c20f4221b3001  
a5f64926e8c"}  
  
{"version_major":2,"version_minor":0,"model_id":"5e225937a3a746e083d0c  
10af1dd20d4"}
```

```
{"version_major":2,"version_minor":0,"model_id":"8e52106847e14a71958a2f4f8a93e4a3"}

{"version_major":2,"version_minor":0,"model_id":"2f6eba8b674b4256aafc00fc2146f79d"}

{"version_major":2,"version_minor":0,"model_id":"c31e0484c3a84f7a821bfaaf1094d967"}

{"version_major":2,"version_minor":0,"model_id":"0a4c8ef3dcd64dc3b6de5600664c1f9a"}

{"version_major":2,"version_minor":0,"model_id":"6723c9e991d04a299cbf306389f06082"}

{"version_major":2,"version_minor":0,"model_id":"f747d78e5e2242da92912856c4eb3a0f"}

{"version_major":2,"version_minor":0,"model_id":"dc3e80deb2fc46be844e8a6bbca3438c"}

{"version_major":2,"version_minor":0,"model_id":"97e5c59b554a4b6684d96b3d210280e9"}

{"version_major":2,"version_minor":0,"model_id":"13dcd98d71df4ecca8749cea295572a7"}

{"version_major":2,"version_minor":0,"model_id":"60d9cbf2995e416e83449d54d3d0cb62"}

{"version_major":2,"version_minor":0,"model_id":"684b0b4e5fffb46a7b8dc771a46c7e36d"}

{"version_major":2,"version_minor":0,"model_id":"896ele7ea54f4b32837d29141bc6c038"}

{"version_major":2,"version_minor":0,"model_id":"02a64d05502e448ab9d575adcc33c9c9"}

{"version_major":2,"version_minor":0,"model_id":"4811d1245c514d58bb7655277fc5f35f"}

{"version_major":2,"version_minor":0,"model_id":"5d7de0038c7f40b8ae2046c3c0006d60"}

{"version_major":2,"version_minor":0,"model_id":"1312935504874691aa901d3d586bcf88"}

{"version_major":2,"version_minor":0,"model_id":"bf7f8a5b1ba44f1bbfe3990b3fb35853"}

{"version_major":2,"version_minor":0,"model_id":"fcb872f9528b45d7ac2d700a9d4a8cff"}
```

```
{"version_major":2,"version_minor":0,"model_id":"ef8873d4b18a4c06b747501f11390484"}

{"version_major":2,"version_minor":0,"model_id":"17532f9b64f64b299b3ff6ca23295385"}

{"version_major":2,"version_minor":0,"model_id":"d78103621a8a4fe18f06edc15ae7f59d"}

{"version_major":2,"version_minor":0,"model_id":"5fcb67b4f7454411a0aaf6c3f0e5cb31"}

{"version_major":2,"version_minor":0,"model_id":"3c2570050e694323a63b0aa27f25062d"}

{"version_major":2,"version_minor":0,"model_id":"e1426192fb374b6babfe69ff77c96b56"}

{"version_major":2,"version_minor":0,"model_id":"7ff0c2e41e0b493aae9a776414483331"}

{"version_major":2,"version_minor":0,"model_id":"0aaddc22c8054acc84482c9ad78f34f3"}

{"version_major":2,"version_minor":0,"model_id":"4820f6fc56264ec9ac9d81b88f7a705f"}

{"version_major":2,"version_minor":0,"model_id":"e3e888573f26490eb07c6fcaecb6c3cb"}

{"version_major":2,"version_minor":0,"model_id":"7f0bc98e02e94217b67b3c0005f054d8"}

{"version_major":2,"version_minor":0,"model_id":"9e31e6b45bc14a7cb48ca9dfa956ca439"}

{"version_major":2,"version_minor":0,"model_id":"f5ad98620625460ebacbed0466d4f8f2"}

{"version_major":2,"version_minor":0,"model_id":"40932512f8c34b1d88167ad52f41be33"}

{"version_major":2,"version_minor":0,"model_id":"d963b34eef9b47f9970e9af73d234a43"}

{"version_major":2,"version_minor":0,"model_id":"ede312101d8b40368949e5bc2d1b1668"}

{"version_major":2,"version_minor":0,"model_id":"2ff5f624a4c14834bb86881d2775cc41"}

{"version_major":2,"version_minor":0,"model_id":"f9ce4f026777499fbce0fc98357dd245"}
```

```
{"version_major":2,"version_minor":0,"model_id":"cd968edef66844bc8b2f5257164ca6e4"}

{"version_major":2,"version_minor":0,"model_id":"7c01ab98260847fdb03ed9a2fcaf2e27"}

{"version_major":2,"version_minor":0,"model_id":"39e4d3ac62cb49e995397eb9ed975de9"}

{"version_major":2,"version_minor":0,"model_id":"dc5205fe0a3440489c885fb11747a64b"}

{"version_major":2,"version_minor":0,"model_id":"ae3e69ad89d74cfca533cceeaaa87652"}

{"version_major":2,"version_minor":0,"model_id":"5abe10d58a494a9faca12cdb67d4f8a9"}

{"version_major":2,"version_minor":0,"model_id":"28ed8af0780c4b4996c3708b63278ec5"}

{"version_major":2,"version_minor":0,"model_id":"2d152b31248848819ca0ff80e1b56f5e"}

{"version_major":2,"version_minor":0,"model_id":"a67a3637d94144e8a1a00cca18e9f418"}

{"version_major":2,"version_minor":0,"model_id":"11d8e441f98d48f7995b57ab767883ec"}

{"version_major":2,"version_minor":0,"model_id":"9874a26a5f8b4f0b9bd06c77e9f33499"}

{"version_major":2,"version_minor":0,"model_id":"64839851d207477abcfa8480c6a7c733"}

{"version_major":2,"version_minor":0,"model_id":"4f7145ed772c47e3ad49f8011a5b0479"}

{"version_major":2,"version_minor":0,"model_id":"b1bbf341bf35470aa3c8b93c549bae6c"}

{"version_major":2,"version_minor":0,"model_id":"1f2eb417dbaa420aae955676d4fff711"}

{"version_major":2,"version_minor":0,"model_id":"68abf5bf389f46dda5785e97fa6692b0"}

{"version_major":2,"version_minor":0,"model_id":"bc5bedc535fb49808359e3d9b72bald7"}

{"version_major":2,"version_minor":0,"model_id":"4f452a8c882f4216a23a97e01047671b"}
```

```
{"version_major":2,"version_minor":0,"model_id":"e2515504c2ac461bafbe0e525edbf93"}

{"version_major":2,"version_minor":0,"model_id":"93b20c3bc28b43e8966390c4c0a2d276"}

{"version_major":2,"version_minor":0,"model_id":"c2efa3f347454fb1a89624aeab22f1cb"}

{"version_major":2,"version_minor":0,"model_id":"e20f27aead6849109310e02b44190ab2"}

{"version_major":2,"version_minor":0,"model_id":"dd15e570418c4e51881406616bd488d0"}

{"version_major":2,"version_minor":0,"model_id":"6ec9099060644c169fd4da41b6a39890"}

{"version_major":2,"version_minor":0,"model_id":"420601f0a23c476aa131d72e3cc90647"}

{"version_major":2,"version_minor":0,"model_id":"c6928e06578b4ccb94d8421e8c385fd3"}

{"version_major":2,"version_minor":0,"model_id":"7886244bf09d4a77baf9f3d231504bb1"}

{"version_major":2,"version_minor":0,"model_id":"533750769a0e461b967a54a7915e8244"}

{"version_major":2,"version_minor":0,"model_id":"c83e1221b6814798948f06cc0ff7209f"}

{"version_major":2,"version_minor":0,"model_id":"f7edba1f7d444efa8130ba0a1efb6251"}

{"version_major":2,"version_minor":0,"model_id":"789fe14e08954204becb18a055031fd3"}

{"version_major":2,"version_minor":0,"model_id":"329da61fce3a413ba643ab135e8aca26"}

{"version_major":2,"version_minor":0,"model_id":"48b5dce8758c4596a0faa5b9246c4b9"}

{"version_major":2,"version_minor":0,"model_id":"aaf4c85d4808454087dee675f4c54efc"}

{"version_major":2,"version_minor":0,"model_id":"87d19891159b49389310d598a013b726"}

{"version_major":2,"version_minor":0,"model_id":"b84554ac196f4d1bafc8b25ae4c4cc0c"}
```



```
{"version_major":2,"version_minor":0,"model_id":"cdf24da813d04affae7288cc09d4924"}
```

```
{"version_major":2,"version_minor":0,"model_id":"1c75c9e4ad414b4a92c860c7c73ea8d9"}
```

```
{"version_major":2,"version_minor":0,"model_id":"c967a4ec1ec243938c28e3a50de3f50e"}
```

```
{"version_major":2,"version_minor":0,"model_id":"0542c300f03b4cb59c7a7a21fb7c0fcd"}
```

```
{"version_major":2,"version_minor":0,"model_id":"fc60b1f877024cd3b7b0d2623a6e1861"}
```

```
{"version_major":2,"version_minor":0,"model_id":"c1d2f4c806004f4391566b6a1a4a87fb"}
```

```
{"version_major":2,"version_minor":0,"model_id":"b27e32d0d5e64159b42a4e2a732f23f7"}
```

```
{"version_major":2,"version_minor":0,"model_id":"2354f81172094f58a903f71ed342619f"}
```

```
{"version_major":2,"version_minor":0,"model_id":"89d237189e114e21aa33beeleda80f03"}
```

```
{"version_major":2,"version_minor":0,"model_id":"1aaca15060dd41759bd029f35da241ff"}
```

```
{"version_major":2,"version_minor":0,"model_id":"339e7584c5574cdaac9dc a163d1c547e"}
```

```
{"version_major":2,"version_minor":0,"model_id":"0315ea62974f46048a373c2c8714bbe4"}
```

```
{"version_major":2,"version_minor":0,"model_id":"3ed07fb3793d48e3af81802047a18363"}
```

```
{"version_major":2,"version_minor":0,"model_id":"d5f54fdbac1c4claaa8ef f7048654598"}
```

```
{"version_major":2,"version_minor":0,"model_id":"d8d37e599160439bb1a437d616a0de55"}
```

```
{"version_major":2,"version_minor":0,"model_id":"c53a38ab323c47e39fa75d7c0cda235e"}
```

```
{"version_major":2,"version_minor":0,"model_id":"e23fcc0401d74e398a842 bdf6c5b572f"}
```

```
{"version_major":2,"version_minor":0,"model_id":"b95bddcb9e1742d1b21b1d5fb3ee70dd"}
```

```
{"version_major":2,"version_minor":0,"model_id":"912efc1a9c4e4fcba27b74b8453ae60a"}

{"version_major":2,"version_minor":0,"model_id":"24a29bc087ac4927a6e2e966614fb6ae"}

{"version_major":2,"version_minor":0,"model_id":"c5b3af6b3d51456290d8fc2ac892b663"}

{"version_major":2,"version_minor":0,"model_id":"12c22eb707bd4ae4993e2c9aa0e06fdf"}

{"version_major":2,"version_minor":0,"model_id":"3c4a4e64d5e64f1b8ea91e9b207cd39e"}

{"version_major":2,"version_minor":0,"model_id":"136a7e734ee843df8aa187b8a99c5818"}

{"version_major":2,"version_minor":0,"model_id":"258fd590323249659e40e89aed23de95"}

{"version_major":2,"version_minor":0,"model_id":"64fcf0f86f794b23b99392f119dbf2e8"}

{"version_major":2,"version_minor":0,"model_id":"eeee5f4a3b9b424f92382ecad720bd68"}

{"version_major":2,"version_minor":0,"model_id":"478194990baf4512b7d1f6aa243c8f59"}

{"version_major":2,"version_minor":0,"model_id":"6fbabf0ba3774f128cb8d50dcd20998e"}

{"version_major":2,"version_minor":0,"model_id":"d6d8539b9ff141acb08176d0c4db45d7"}

{"version_major":2,"version_minor":0,"model_id":"ad469d95a6814281909b1b3ad3054fe3"}

{"version_major":2,"version_minor":0,"model_id":"426bc6b00bc54098b630a9e050420767"}

{"version_major":2,"version_minor":0,"model_id":"ec66550d3f4743c5863a27c2c847ca4c"}

{"version_major":2,"version_minor":0,"model_id":"4a39e9adb0ff4c7e9ec338e47955b771"}

{"version_major":2,"version_minor":0,"model_id":"a64fc8caa31249d395d8146a7fca636b"}

{"version_major":2,"version_minor":0,"model_id":"e82801d86480425796f0fda0d0a6ceee"}
```

```
{"version_major":2,"version_minor":0,"model_id":"ee69cf86cba446f18b2e02c6e9da4ae7"}

{"version_major":2,"version_minor":0,"model_id":"294ad2a09367498d9bebed7cabbd6ddf"}

{"version_major":2,"version_minor":0,"model_id":"a3d361a76b594812a6ae15a9b3dbda21"}

{"version_major":2,"version_minor":0,"model_id":"0402807513784d39b73efb9def3f68ce"}

{"version_major":2,"version_minor":0,"model_id":"32be3ce183fb4e73a2e86893cae26859"}

{"version_major":2,"version_minor":0,"model_id":"0808bdbd8b95450b928bca4f66ccc205"}

{"version_major":2,"version_minor":0,"model_id":"640e37cc192b4623a44e5d16c31c185b"}

{"version_major":2,"version_minor":0,"model_id":"bbfccf6fbe8748f18068beda76ff82d9"}

{"version_major":2,"version_minor":0,"model_id":"77b896571b7049ac95bce2113953cbea"}

{"version_major":2,"version_minor":0,"model_id":"519b860d27c84c49a717b8774a4b2cda"}

{"version_major":2,"version_minor":0,"model_id":"fc22f191e4b34fd7a046485db04247f0"}

{"version_major":2,"version_minor":0,"model_id":"d00eb4a7c3e84feb85c4d6aae5440bfa"}

{"version_major":2,"version_minor":0,"model_id":"3db4624973174c7397d49c9518e934e9"}

{"version_major":2,"version_minor":0,"model_id":"29512a81f4e14b4aa6990505d1e0f6fb"}

{"version_major":2,"version_minor":0,"model_id":"75a29addbbd047b6a19450aac82769c1"}

{"version_major":2,"version_minor":0,"model_id":"0bf4b5c747324d50aa8ef448d7adb76a"}

{"version_major":2,"version_minor":0,"model_id":"55e3a70d5fad488dbf840052bb1470a4"}

{"version_major":2,"version_minor":0,"model_id":"8b3deee79ae84466bc798bdbaa951cb6"}
```

```
{"version_major":2,"version_minor":0,"model_id":"59f659ff34c5493c955bc361d531bbff"}

{"version_major":2,"version_minor":0,"model_id":"d995270319d04029ab2364e53dde33a4"}

{"version_major":2,"version_minor":0,"model_id":"d3620ec4e3a04de6b07879b1b6de7c9c"}

{"version_major":2,"version_minor":0,"model_id":"e9c4549a0dc34051abfb47a1df3cb2a5"}

{"version_major":2,"version_minor":0,"model_id":"d6b6d3557e334a45a495518e91ac16bc"}

{"version_major":2,"version_minor":0,"model_id":"6efde81c965e40239a511a56c5edb520"}

{"version_major":2,"version_minor":0,"model_id":"ad671cb39ba04e8ca3d4cbe203adae17"}

{"version_major":2,"version_minor":0,"model_id":"54e1409f253f46ab8966724ca48f3177"}

{"version_major":2,"version_minor":0,"model_id":"3302dea71c364081bd620f2fd088a529"}

{"version_major":2,"version_minor":0,"model_id":"6d36ca2b353f44e99261a11c49ac2804"}

{"version_major":2,"version_minor":0,"model_id":"1641a0b0a85248e3a0c539537fd7f1e9"}

{"version_major":2,"version_minor":0,"model_id":"67e35d67bc594c6ba605fc162e77a7e1"}

{"version_major":2,"version_minor":0,"model_id":"4de9ad2412aa4a759eee81a20d0cbb42"}

{"version_major":2,"version_minor":0,"model_id":"949534684d924c46ac72b1d35b1d3855"}

{"version_major":2,"version_minor":0,"model_id":"314967bd557a473f898ac97d2b6898e9"}

{"version_major":2,"version_minor":0,"model_id":"8bbc22e179f54314bf14e48e23be215a"}

{"version_major":2,"version_minor":0,"model_id":"d34ec58735aa47ce84ca82eaaaf412e78"}

{"version_major":2,"version_minor":0,"model_id":"482531459e194b8c9b223d44e764394d"}
```

```
{"version_major":2,"version_minor":0,"model_id":"a097049e92e14cf18cb2148e67e04344"}

{"version_major":2,"version_minor":0,"model_id":"f9fc7771fa5040449350f6c1db6a61be"}

{"version_major":2,"version_minor":0,"model_id":"92845f034a8f4520b5891bac2b92afbb"}

{"version_major":2,"version_minor":0,"model_id":"419c0ffde9f64f12980374170189c899"}

{"version_major":2,"version_minor":0,"model_id":"41dda500949341eea5bb561d2339f999"}

{"version_major":2,"version_minor":0,"model_id":"25969f0825064b22aa50959a0f6722fc"}

{"version_major":2,"version_minor":0,"model_id":"ba40159bd3dd4af09744dcddb2eb078e"}

{"version_major":2,"version_minor":0,"model_id":"ff024b784a3f40b680b77ab5af548173"}

{"version_major":2,"version_minor":0,"model_id":"fad69ee73eec4391aab4eadce5f31dae"}

{"version_major":2,"version_minor":0,"model_id":"0f33c2a66c874f77b9e39490007be0f1"}

{"version_major":2,"version_minor":0,"model_id":"f06b0961895c4b1394c472759aace005"}

{"version_major":2,"version_minor":0,"model_id":"dd9ad1cb00664e96bf999838ef67a138"}

{"version_major":2,"version_minor":0,"model_id":"595417c12c4e402db64ee9e60d286505"}

{"version_major":2,"version_minor":0,"model_id":"75a5a2d859aa4253a78d453d3f24b0a3"}

{"version_major":2,"version_minor":0,"model_id":"c340fcb13e3e4596853d910c028a4a41"}

{"version_major":2,"version_minor":0,"model_id":"f3a720848b024005be91114e6daa1634"}

{"version_major":2,"version_minor":0,"model_id":"79db9a9e229b4760837948d226f5e5ff"}

{"version_major":2,"version_minor":0,"model_id":"528ccd48fa3b43f39e35d24e2ca97a5c"}
```

```
{"version_major":2,"version_minor":0,"model_id":"40857cb4780545c6aa5fcdabc3b2a73b"}
```

```
{"version_major":2,"version_minor":0,"model_id":"a440b6d800dd4728a80fe4a04ef7906f"}
```

```
{"version_major":2,"version_minor":0,"model_id":"10258dd974a7449e81bccd22a03dca49"}
```

```
{"version_major":2,"version_minor":0,"model_id":"3fad2de1aa59400180e0fb62531bd544"}
```

```
{"version_major":2,"version_minor":0,"model_id":"7578c98899eb43a6a325517f7476c7e7"}
```

```
{"version_major":2,"version_minor":0,"model_id":"69bd58688c6a48f499ff926201735bf6"}
```

```
{"version_major":2,"version_minor":0,"model_id":"29569bab5cab49838975a30aced7d623"}
```

```
{"version_major":2,"version_minor":0,"model_id":"a3361391ac8d4383b6afdf3e7c0a64af"}
```

```
{"version_major":2,"version_minor":0,"model_id":"6d2cd61150de4b50b46cf68914fbd636"}
```

```
{"version_major":2,"version_minor":0,"model_id":"80c61c7503a9483e8b06012e0845fe22"}
```

```
{"version_major":2,"version_minor":0,"model_id":"2e9b5c12e81d4bbdacd804a3f9623fc3"}
```

```
{"version_major":2,"version_minor":0,"model_id":"1ff1b283e26a4320acd7fc89418449b5"}
```

```
{"version_major":2,"version_minor":0,"model_id":"32910a34d5bd42cda0b31dd1d53c4ab4"}
```

```
{"version_major":2,"version_minor":0,"model_id":"88ba682d47b44e1eb409735bb305ac14"}
```

```
{"version_major":2,"version_minor":0,"model_id":"849efec0b2364a1f9c81ddc82c6d5eed"}
```

```
{"version_major":2,"version_minor":0,"model_id":"4ad13451cdca4345a5f47e6565d96694"}
```

```
{"version_major":2,"version_minor":0,"model_id":"39db000593014424a1f8852d8baa51cd"}
```

```
{"version_major":2,"version_minor":0,"model_id":"a899cb1b165f460f840a8eaa3cee79de"}
```

```
{"version_major":2,"version_minor":0,"model_id":"2c33e90db2074a94a29b3aa106649470"}
```

```
{"version_major":2,"version_minor":0,"model_id":"22513b386f624847add223ef2136aca"}
```

```
{"version_major":2,"version_minor":0,"model_id":"7b5e5f111c5747d5ab62a929d604d731"}
```

```
{"version_major":2,"version_minor":0,"model_id":"8ac447d32adc4a38afb9a92ebeccb46d"}
```

```
{"version_major":2,"version_minor":0,"model_id":"ece20fa56eb14bffaaf06eb9a72fdd71"}
```

```
{"version_major":2,"version_minor":0,"model_id":"829618f685664672bda619dc09b72c0f"}
```

```
{"version_major":2,"version_minor":0,"model_id":"67cb2e46fcc6415e8e95eedf85f67cda"}
```

```
{"version_major":2,"version_minor":0,"model_id":"99859a8f8bb34dd5b23207085b57f0fa"}
```

```
{"version_major":2,"version_minor":0,"model_id":"d0dca6a4ed3a4de29dc2c543d30d1fd1"}
```

```
{"version_major":2,"version_minor":0,"model_id":"e8ab478f118240babede17840f9265e8"}
```

```
{"version_major":2,"version_minor":0,"model_id":"42d2071f247542eb889d6c23cc317287"}
```

```
{"version_major":2,"version_minor":0,"model_id":"44a9592aa796451a88a1571b0369618c"}
```

```
{"version_major":2,"version_minor":0,"model_id":"76df084cd433498c8a2a99a5b44fd531"}
```

```
{"version_major":2,"version_minor":0,"model_id":"3ce5b1e77ed6466a8069952b7742241a"}
```

```
{"version_major":2,"version_minor":0,"model_id":"1f327dae63574c66abcc3fae9fdb6e14"}
```

```
{"version_major":2,"version_minor":0,"model_id":"b45a29b4e8964f6e8ff468ef9d94876c"}
```

```
{"version_major":2,"version_minor":0,"model_id":"364d78edcc4f4cdc8916e551258174f6"}
```

```
{"version_major":2,"version_minor":0,"model_id":"bc23ca33ad784e62a99eba241e99b9f7"}
```

```
{"version_major":2,"version_minor":0,"model_id":"22678b2d9ab04f68890cb3b6a2e5e2b9"}
```

```
{"version_major":2,"version_minor":0,"model_id":"69211dc8b3f34ae6b59a0c67d42ad228"}
```

```
{"version_major":2,"version_minor":0,"model_id":"ecd42f12fe3b47669f53ce1d5c16b27c"}
```

```
{"version_major":2,"version_minor":0,"model_id":"2d28f89c6f6e46ad99efe24fe98c2140"}
```

```
{"version_major":2,"version_minor":0,"model_id":"54c0fb45d12d471b870d3cb2fcdd4e15"}
```

```
{"version_major":2,"version_minor":0,"model_id":"166899771d1e46d2a8bc415f35686d84"}
```

```
{"version_major":2,"version_minor":0,"model_id":"351d0ac07b9d4b6e9a35e6bf9a329bea"}
```

```
{"version_major":2,"version_minor":0,"model_id":"d40ec7eeca8f4cf7bf7bdf4465702229"}
```

```
{"version_major":2,"version_minor":0,"model_id":"6cc7b075751a4ad3a0abb5c4bb240d4b"}
```

```
{"version_major":2,"version_minor":0,"model_id":"a4b3e92948ae46dd9392d26c62d8fb58"}
```

```
{"version_major":2,"version_minor":0,"model_id":"63313a62bfcf48ec82da79b7b7bfaa8f"}
```

```
{"version_major":2,"version_minor":0,"model_id":"88fd81913b994991b2cbb a84c33111c7"}
```

```
{"version_major":2,"version_minor":0,"model_id":"1afe3ff5c81c4b7fac3acc9f0c0d1fa3"}
```

```
{"version_major":2,"version_minor":0,"model_id":"dfac7eac0e57449b896a51092c44d718"}
```

```
{"version_major":2,"version_minor":0,"model_id":"26e32728da674f5082ca663bfe6be9da"}
```

```
{"version_major":2,"version_minor":0,"model_id":"c64c3fbf5e7e4d2188dd8d41d543cacd"}
```

```
{"version_major":2,"version_minor":0,"model_id":"b27cbb3d189046f8b8183ae81ecf79bb"}
```

```
{"version_major":2,"version_minor":0,"model_id":"d820659101be4f96924b610d2bbccdd4"}
```



```
{"version_major":2,"version_minor":0,"model_id":"da61bdb5534b43c58a3aa131fb37d798"}

{"version_major":2,"version_minor":0,"model_id":"6186247f1d7642e0919f85f2173e4e99"}

{"version_major":2,"version_minor":0,"model_id":"3ba22ad0318942f294b646de245ae244"}

{"version_major":2,"version_minor":0,"model_id":"dba163ff5bbf4db997e7c70178494084"}

{"version_major":2,"version_minor":0,"model_id":"dd4c748bf7324753bcb53d244f966882"}

{"version_major":2,"version_minor":0,"model_id":"435c6e73a5484ff599f734bda8c6d02b"}

{"version_major":2,"version_minor":0,"model_id":"890f44ec371a40baa74c1b5a8574d038"}

{"version_major":2,"version_minor":0,"model_id":"a4bdfd292ae54be99dffdb4d74cc6968"}

{"version_major":2,"version_minor":0,"model_id":"3d3da34281c24a9286405c33e53b0505"}

{"version_major":2,"version_minor":0,"model_id":"74030faaf7884dd4ad8ade68559069d6"}

{"version_major":2,"version_minor":0,"model_id":"229a35c5637041a8b5fa3086c63dd26a"}

{"version_major":2,"version_minor":0,"model_id":"9864fd2ab61a4a40a59c735e66d2a099"}

{"version_major":2,"version_minor":0,"model_id":"adefb1d9114641b0b9c4988927e94714"}

{"version_major":2,"version_minor":0,"model_id":"2168150d10fb41a1b8d712fce7928707"}

{"version_major":2,"version_minor":0,"model_id":"ee150bff527649d2b0fc30b91e090812"}

{"version_major":2,"version_minor":0,"model_id":"36b6c5b8146a4bbcb1b361eff216580e"}

{"version_major":2,"version_minor":0,"model_id":"61b0d619c9664c369c98cb73b61eb9bb"}

{"version_major":2,"version_minor":0,"model_id":"5b62b7bf6d29448b8aa3a3c4fbe9440d"}
```

```
{"version_major":2,"version_minor":0,"model_id":"d5395ce49b1544fd81cb6
decf4a665b2"}

{"version_major":2,"version_minor":0,"model_id":"ff20681abc0942acbc0d8
f396aee6c8e"}

{"version_major":2,"version_minor":0,"model_id":"f5621ecf90ec40f5ac6a0
872f829474b"}

{"version_major":2,"version_minor":0,"model_id":"d6c4a11bd7624589a6415
f27b48f5a22"}

{"version_major":2,"version_minor":0,"model_id":"55745abda913437c82c1f
8bd799b8b10"}

{"version_major":2,"version_minor":0,"model_id":"33de57b44ba249518b61d
3e59b056c23"}

{"version_major":2,"version_minor":0,"model_id":"aff4e385603948ab87511
5a6c8995364"}

{"version_major":2,"version_minor":0,"model_id":"7296dee088934d6881905
3d190e32317"}

{"version_major":2,"version_minor":0,"model_id":"72e5a14486b9478ab9be0
eef3eff1943"}

{"version_major":2,"version_minor":0,"model_id":"7aeab27dea4743839430c
571bd7445e3"}

{"version_major":2,"version_minor":0,"model_id":"c976bb4dfd7e400cbd826
8b7c7e05011"}

{"version_major":2,"version_minor":0,"model_id":"5c9a37b422e8424d9694e
fd8d7b33a87"}

{"version_major":2,"version_minor":0,"model_id":"27d9195519844c42ba4af
d8d62a91c48"}

{"version_major":2,"version_minor":0,"model_id":"36bed4796173407f99fd1
215542b6e29"}

{"version_major":2,"version_minor":0,"model_id":"0890e006bd0d4dd3995cc
4e40dc52b84"}

{"version_major":2,"version_minor":0,"model_id":"b5cd7e5b425e407b98f6e
ef895e44d31"}

{"version_major":2,"version_minor":0,"model_id":"be064659624f43fcdb1e
fd9267f613e"}

{"version_major":2,"version_minor":0,"model_id":"926f9367d9494bbc810b5
ed740e7d2d8"}
```

```
{"version_major":2,"version_minor":0,"model_id":"a4fbd84dfbaa491c89ff775d7b90e7ca"}
```

```
{"version_major":2,"version_minor":0,"model_id":"41978c3112d847ff9be737e56651ae96"}
```

```
{"version_major":2,"version_minor":0,"model_id":"d54bfb8023804a48b66932379a17b3a3"}
```

```
{"version_major":2,"version_minor":0,"model_id":"7379a2b514e44227b2f5e8641fce7423"}
```

```
{"version_major":2,"version_minor":0,"model_id":"b6614aad2724465b962af8b5ec7f9a66"}
```

```
{"version_major":2,"version_minor":0,"model_id":"e441c99d76a94423b739c5375d3ae494"}
```

```
{"version_major":2,"version_minor":0,"model_id":"b08770ec2022434d8c595f0a838ee232"}
```

```
{"version_major":2,"version_minor":0,"model_id":"a5def97cee984180bf2e4f8b33a17d5e"}
```

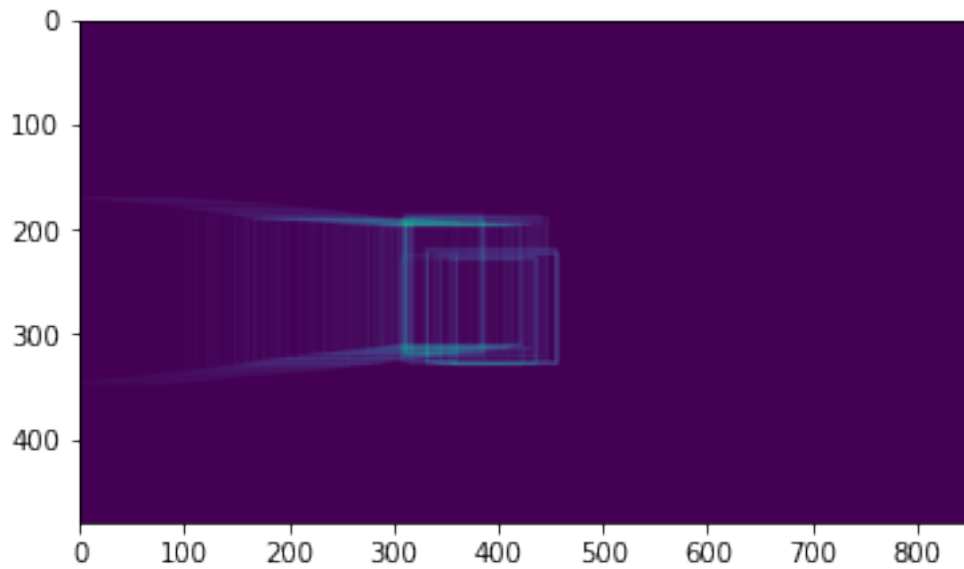
```
{"version_major":2,"version_minor":0,"model_id":"0f985e70daa74ca3a1e72a83a68ae2d0"}
```

```
{"version_major":2,"version_minor":0,"model_id":"02386c0451cf4d52bd8384c5c2e3f0d5"}
```

```
{"version_major":2,"version_minor":0,"model_id":"cb3ba26fcbc646adbe52d34a482d4273"}
```

```
plt.imshow(sum(bboxes))
```

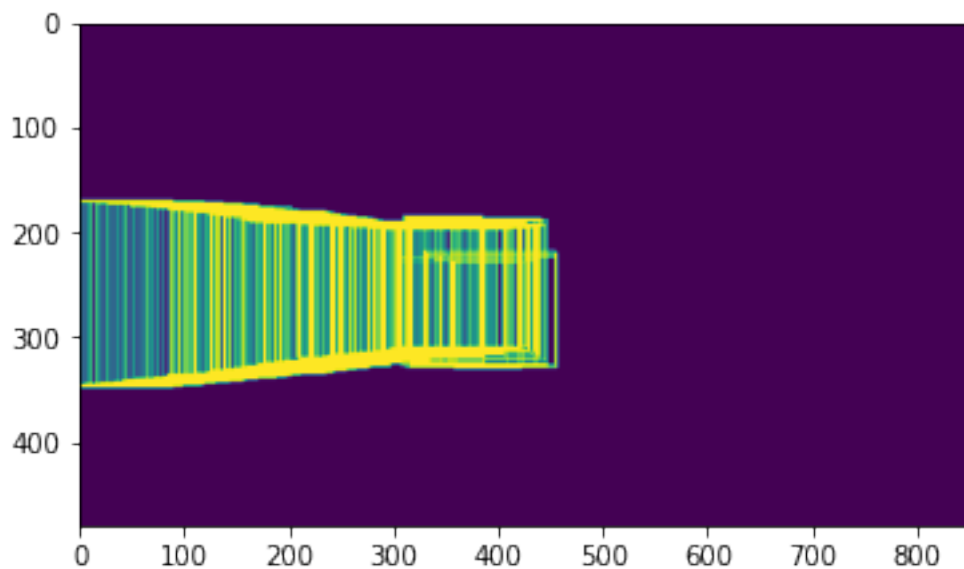
```
<matplotlib.image.AxesImage at 0x7f77657a0640>
```



```
import pickle
with open("tracking_tacko2.pickle", "wb") as f:
    pickle.dump( bboxes, f)
```

```
test = sum(bboxes)
test = np.where(test!=0,255,0)
plt.imshow(test)
```

<matplotlib.image.AxesImage at 0x7f77656970a0>



```
# create video
import cv2
```

```

fourcc = cv2.VideoWriter_fourcc('M','J','P','G')

video = cv2.VideoWriter("flying_taco_video.avi", fourcc, 10, (854,
480), isColor=True)

for idx, i in tqdm(enumerate(os.listdir(path_to_taco))):
    path_to_image = os.path.join(path_to_taco, i)
    image = cv2.imread(path_to_image)

    sub_bbox = bboxes[idx]

    image[...,0][np.where(sub_bbox != 0)] = 255
    image[...,1:][np.where(sub_bbox != 0)] = 0

    video.write(image)

{"version_major":2,"version_minor":0,"model_id":"bdf87977057b4885961be
0b610c9c67f"}

# Video is here:
https://github.com/IvanMatoshchuk/cv2122_assignments/blob/dev-ivan/
flying_taco_video.mp4

from IPython.display import Video, HTML

Video("flying_taco_video.mp4", embed=True)

<IPython.core.display.Video object>

```

Exercise 1.4 (BONUS)

- find connected components using a one-pass algorithm
- plot the resulting image and compare it to the result of your two-pass implementation (**RESULT**)

implemented above
here is it once again:

```

def one_pass(input_array: np.ndarray, kernel: np.ndarray) ->
np.ndarray:

    kernel_size = kernel.shape[0]

    output_1_pass = np.zeros_like(input_array)

    input_array = np.pad(input_array,1)

```

```

steps_height = set_steps(input_array.shape[0], kernel.shape[0])
steps_width = set_steps(input_array.shape[1], kernel.shape[1])
label = 1
for i in tqdm(range(steps_height)):
    for j in range(steps_width):

        not_background =
np.where((input_array[i:kernel_size+i, j:kernel_size+j] != 0) & (kernel !=
0))
        if len(not_background[0]) > 0:
            # check neighborhood , if some pixels are labeled,
take their label
            unique_labels_in_window = np.unique(output_1_pass[i +
not_background[0] - 1, j + not_background[1]-1])

            if
len(unique_labels_in_window[unique_labels_in_window != 0]) < 1:

                output_1_pass[i + not_background[0] - 1, j +
not_background[1]-1] = label
                label += 1
            else:
                label_in_window =
min(unique_labels_in_window[unique_labels_in_window != 0])

                output_1_pass[i + not_background[0] - 1, j +
not_background[1]-1] = label_in_window

            # relable sequentially
            for idx, i in enumerate(np.unique(output_1_pass)):
                output_1_pass[np.where(output_1_pass == i)] = idx

        return output_1_pass

```

Exercise 2: Convolution and Canny edge detection

Exercise 2.1: Convolution

Implement the convolution operation for 2-D images (i.e. no colors here, sorry).

```

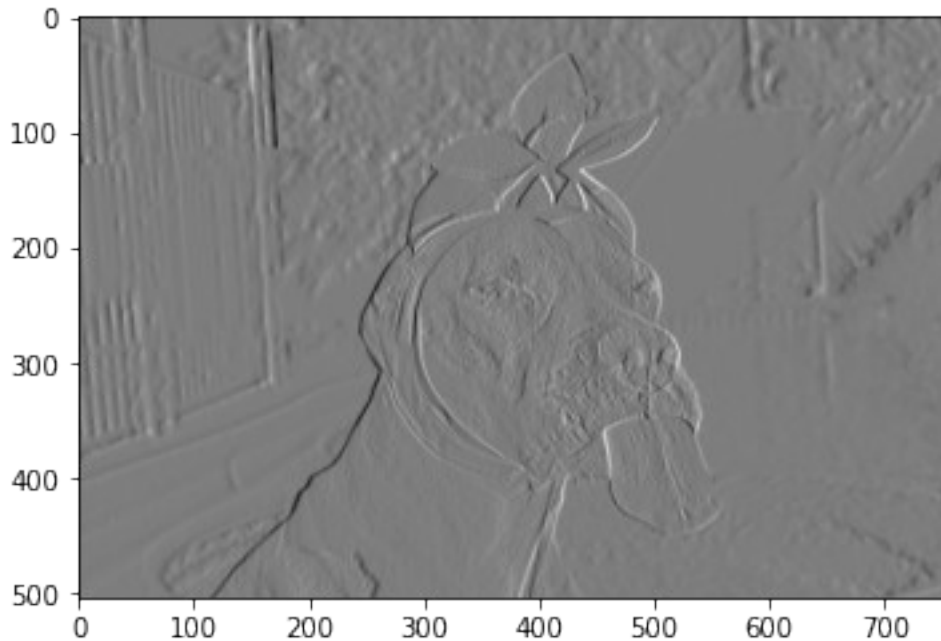
def conv2d(image, kernel):
    m, n = kernel.shape
    if (m == n):
        y, x = image.shape
        y = y - m + 1
        x = x - m + 1
        new_image = np.zeros((y, x))
    for i in range(y):
        for j in range(x):
            new_image[i][j] = np.sum(image[i:i+m, j:j+m]*kernel)

```

```
return new_image
```

```
image = color.rgb2gray(io.imread('images/dog.jpg'))  
plt.imshow(conv2d(image, np.array([[ -1, 0, 1], [ -1, 0, 1], [ -1, 0, 1]])),  
cmap='gray')
```

```
<matplotlib.image.AxesImage at 0x7fe0d254aa90>
```



Convolve an image of your choice with a Gaussian kernel. Play around with the size of the kernel and the standard deviation of the Gaussian. Show your results (**RESULT**).

```
def dnorm(x, mu, sd):  
    return 1 / (np.sqrt(2 * np.pi) * sd) * np.e ** (-np.power((x - mu)  
/ sd, 2) / 2)
```

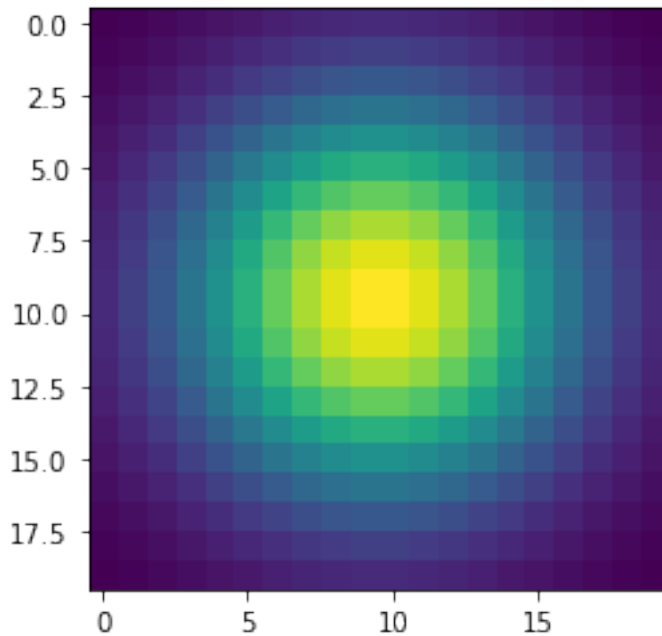
```
def gaussian_kernel(size, sigma=1, verbose=False):  
    kernel_1D = np.linspace(-(size // 2), size // 2, size)  
    for i in range(size):  
        kernel_1D[i] = dnorm(kernel_1D[i], 0, sigma)  
    kernel_2D = np.outer(kernel_1D.T, kernel_1D.T)  
  
    kernel_2D *= 1.0 / kernel_2D.max()  
  
    if verbose:  
        plt.imshow(kernel_2D, interpolation='none', cmap='gray')  
        plt.title("Image")
```

```
plt.show()

return kernel_2D
kernel = gaussian_kernel(20,5)
plt.imshow(conv2d(image, kernel), cmap='gray')
plt.title("gaussian smoothing, mean = 0, std = 5")
plt.show()
```



```
plt.imshow(kernel)
<matplotlib.image.AxesImage at 0x7fe0e1d54f70>
```

Now, implement a simple edge detector by first filtering with a Sobel operator and then thresholding the **RESULT**. How does smoothing the input change the **RESULT**?

```
filter_kernel = np.array([[ -1, 0, 1],
                          [ -2, 0, 2],
                          [ -1, 0, 1]])

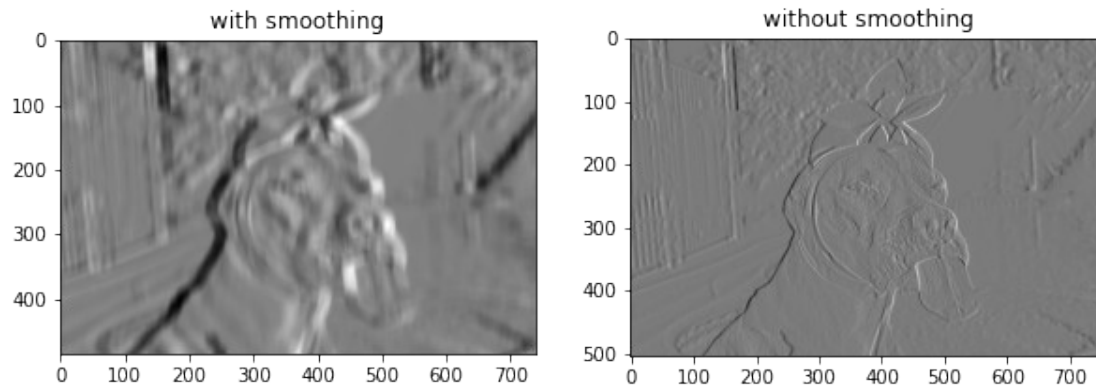
with_gaus = conv2d(conv2d(image, kernel), filter_kernel)
without_gaus = conv2d(image, filter_kernel)

fig, ax = plt.subplots(1, 2, figsize = (10, 6))

ax[0].imshow(with_gaus, cmap = 'gray')
ax[0].set_title('with smoothing')

ax[1].imshow(without_gaus, cmap = 'gray')
ax[1].set_title('without smoothing')

Text(0.5, 1.0, 'without smoothing')
```



Exercise 2.2: Canny Edge Detection

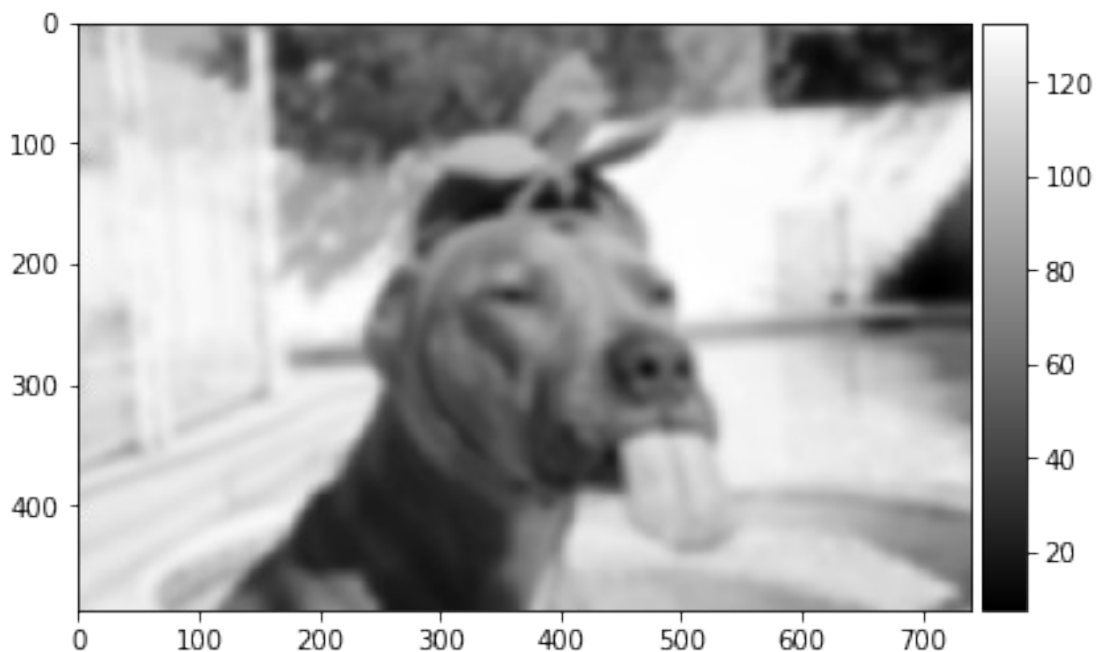
Preprocessing

If you haven't yet: smooth the image with a Gaussian of your choice. Then use the Sobel operator to create the gradient magnitude and direction matrices (see slides page 23). Round the gradient directions to the 8-neighbor's directions. Display all intermediate **RESULTS**!

Smooth the image with a Gaussian

```
kernel = gaussian_kernel(20,5)
image_conv = conv2d(image, kernel)

io.imshow(image_conv, cmap = 'gray')
<matplotlib.image.AxesImage at 0x7fe0d22c5a00>
```

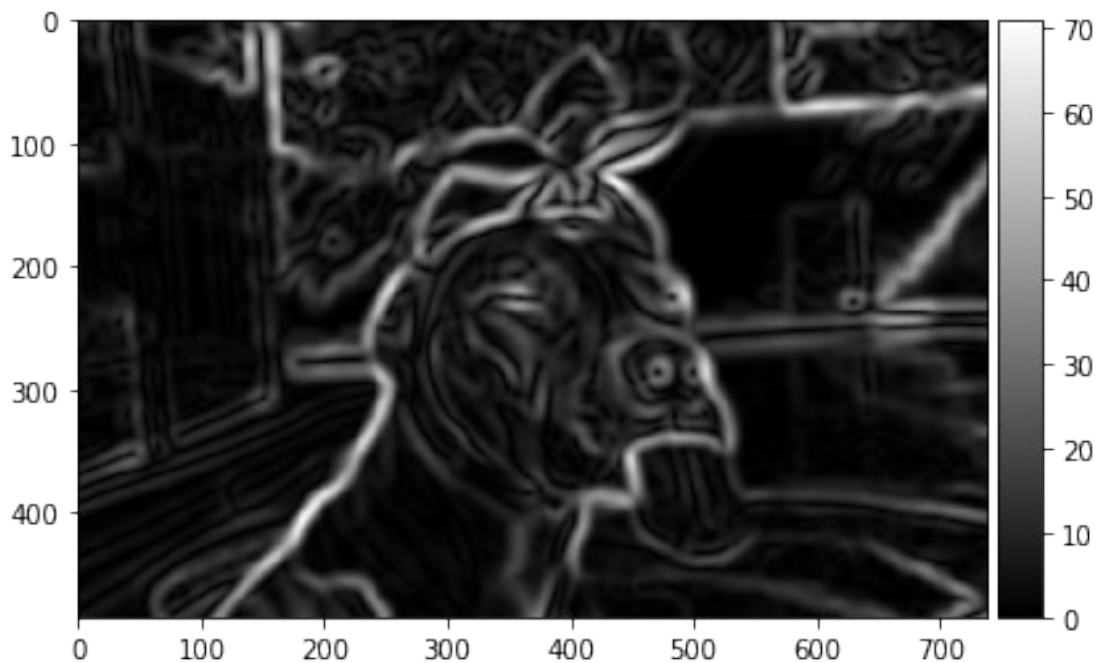


```

filter_kernel = np.array([[ -1, 0, 1], [ -2, 0, 2], [ -1, 0, 1]])
new_image_x = conv2d(image_conv, filter_kernel)
new_image_y = conv2d(image_conv, np.transpose(filter_kernel))
gradient_magnitude = np.sqrt(np.square(new_image_x) +
np.square(new_image_y))

io.imshow(gradient_magnitude, cmap = 'gray')
theta = np.arctan2(new_image_y, new_image_x)

```



Non-Maximum Suppression

Implement the Non-Maximum Suppression step as described in the lecture. Subtract the result from the gradient magnitude image and show the **RESULT**!

```

def non_max_suppression(img, D):
    M, N = img.shape
    Z = np.zeros((M,N), dtype=np.int32)
    angle = D * 180. / np.pi
    angle[angle < 0] += 180

    for i in range(1,M-1):
        for j in range(1,N-1):
            try:
                q = 255
                r = 255

                #angle 0

```

```

180):
    if (0 <= angle[i,j] < 22.5) or (157.5 <= angle[i,j] <=
        q = img[i, j+1]
        r = img[i, j-1]
    #angle 45
    elif (22.5 <= angle[i,j] < 67.5):
        q = img[i+1, j-1]
        r = img[i-1, j+1]
    #angle 90
    elif (67.5 <= angle[i,j] < 112.5):
        q = img[i+1, j]
        r = img[i-1, j]
    #angle 135
    elif (112.5 <= angle[i,j] < 157.5):
        q = img[i-1, j-1]
        r = img[i+1, j+1]

    if (img[i,j] >= q) and (img[i,j] >= r):
        Z[i,j] = img[i,j]
    else:
        Z[i,j] = 0

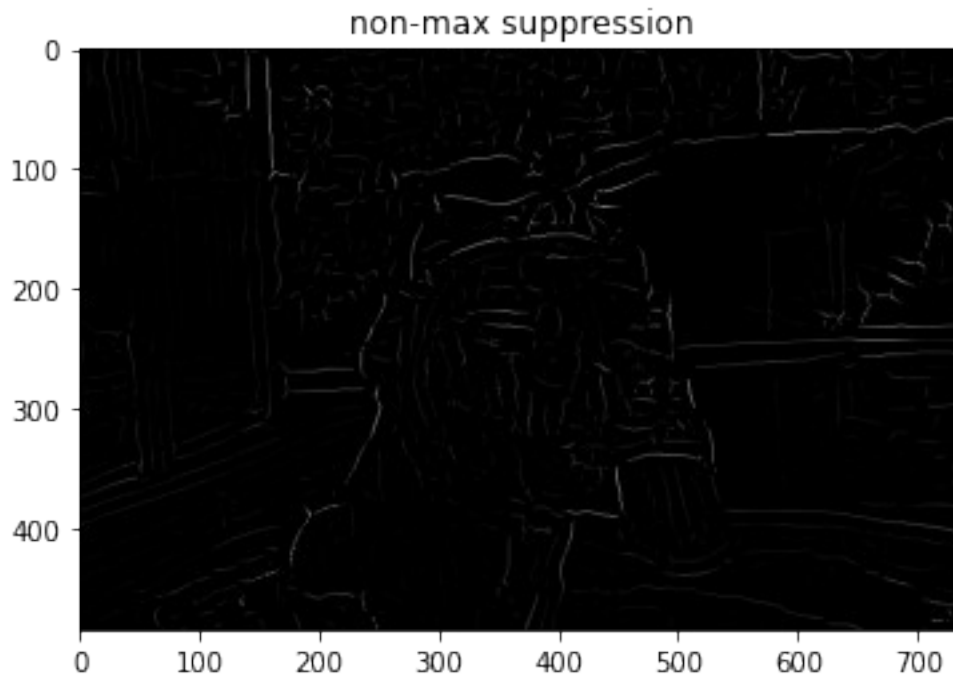
except IndexError as e:
    pass

return Z

image_nms = non_max_suppression(magnitude, theta)
plt.imshow(image_nms, cmap='gray')
plt.title("non-max suppression")

Text(0.5, 1.0, 'non-max suppression')

```



Thresholding and Edge Tracing

Implement the edge tracing as described in the lecture and show the final result for three different threshold pairs: two low thresholds (e.g. 20 and 50), high thresholds (e.g. 80 and 120) and thresholds with large spacing (e.g. 40 and 140). (**RESULT**)

```
def threshold(img, threshold_low_ratio=0.1, threshold_top_ratio=0.15):
    threshold_top_boundary = img.max() * threshold_top_ratio;
    threshold_low_boundary = threshold_top_ratio *
threshold_low_ratio;

    M, N = img.shape
    res = np.zeros((M,N), dtype=np.int32)

    weak = np.int32(25)
    strong = np.int32(255)

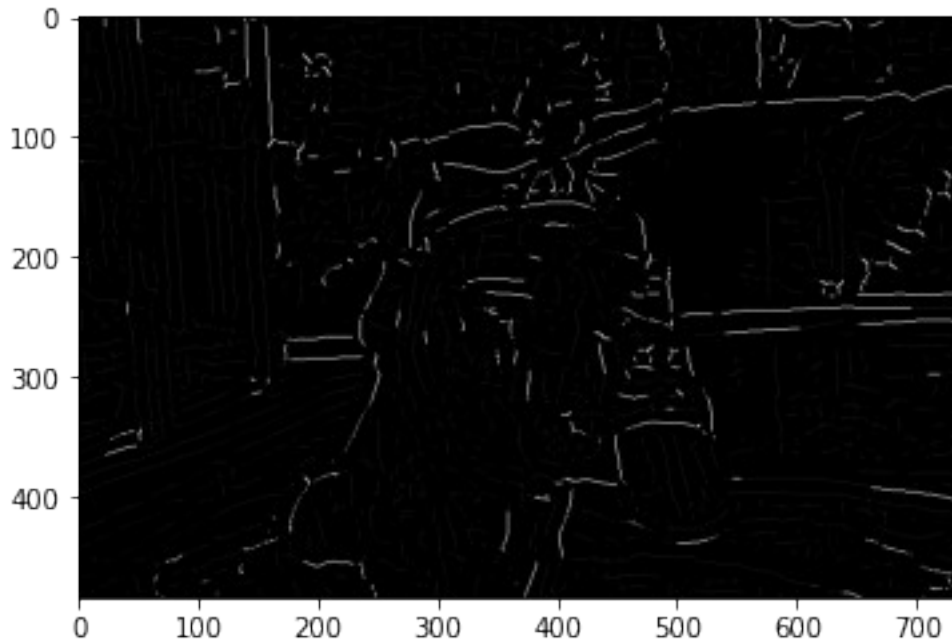
    strong_i, strong_j = np.where(img >= threshold_top_boundary)
    zeros_i, zeros_j = np.where(img < threshold_low_boundary)

    weak_i, weak_j = np.where((img <= threshold_top_boundary) & (img
>= threshold_low_boundary))

    res[strong_i, strong_j] = strong
    res[weak_i, weak_j] = weak

    return (res, weak, strong)
```

```
(image_nms_thres, w, s) = threshold(image_nms, threshold_low_ratio =  
0.12, threshold_top_ratio = 0.25)  
plt.imshow(image_nms_thres, cmap='gray')  
<matplotlib.image.AxesImage at 0x7fe0d90753d0>
```



Congratz, you made it! You can now try to solve this optional exercise.

This exercise is not graded, but might be a good preparation for the exam.

Please go to the following link: <https://forms.gle/wMNmbTu1sAAWQz8d8>.

In the form, you will find the optional task (and the corresponding consent form in case you agree with us processing your data). The task is formulated in German, and we would prefer German as the language for your answer. However, if you don't feel comfortable with that, please feel free to solve it in English.